

CANADIAN PUBLIC HEALTH JOURNAL

DEVOTED TO PREVENTIVE MEDICINE

VOLUME 29

November, 1938

NUMBER 11

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SEVENTH ANNUAL CHRISTMAS MEETING, LABORATORY SECTION
TORONTO, DECEMBER 19-21

PUBLISHED MONTHLY BY THE
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CANADIAN PUBLIC HEALTH JOURNAL

VOL. 29, NO. 11



NOVEMBER, 1938

Practical Achievements in Vital Statistics*

R. H. COATS, LL.D., B.A.

Dominion Statistician

Dominion Bureau of Statistics, Ottawa

IT was very kind of you to ask me to be your speaker at this luncheon. This is a professional and family gathering, not one to whom statistics are just figures in a row—to whom one must be facetious, on the assumption that statistics are a dry subject. Statistics are not dry. As a matter of fact, there are no dry or dull subjects—only dull people. That is not original, but I have forgotten the author.

I believe I was the very first person to perpetrate a speech upon this Section, so time to-day has swung full circle. You have doubtless forgotten, but I have not, that it was I who had the honour of being called to the chair on the occasion of the first meeting of this Section. That was in Toronto in 1930 when the Section was put to the test of producing a worth-while Canadian program, and acquitted itself even better than we had hoped. Mr. Stuart Muirhead of Regina, you will remember, was selected as secretary or wheel-horse. Under him and Mr. Tracey his successor, the Section has met every year since, and every year has justified its existence with at least two or three papers that have contributed to permanent knowledge. More, it has acted as a forum for the debate of official policies, and as machinery for furthering them, that has proved of great usefulness. Let me give an instance or two.

At that very first meeting two papers were read which led to the setting up of committees whose advice later produced results of definite value. The first of these on "What is a Stillbirth?", by Dr. Eugene Gagnon, eventually suggested the official definition now in force in Canada, namely, $6\frac{1}{2}$ months or 28 weeks as the minimum period of gestation, with absence of pulmonary respiration at the

*Presented at a conference of the Section of Vital Statistics and Epidemiology of the Canadian Public Health Association held in Ottawa on June 16, 1938.

birth. The second, on "Registration of Resident and non-resident Deaths" by Dr. Grant Fleming, led to a set of rules under which we are all successfully working to-day, and which have borne fruit in a report published by our Bureau in 1935 giving entirely new figures of births and deaths by localities of residence—a reform which I hope will become a matter of annual routine. Imperfections still remain in the figures but they will be overcome in time by following the impulse of Dr. Fleming's paper.

In 1933-34, I might add, a committee of the Canadian Public Health Association, working in co-operation with the Bureau and the Provincial Departments, suggested some important reforms in the medical certificate of death, whereby more clearcut definition of the causes or train of causes resulting in the death has been achieved. The recommendations were the result of an intensive study conducted by the committee with the co-operation of a number of hospitals and a group of practising physicians. The new certificate, with some additional clarification applying to violent deaths, was placed in the field in 1935. I cite these as instances of a constantly stimulating influence.

Speaking more at large, I think we have attained in Canada a pretty satisfactory basis for better and better vital statistics. Canada is a Confederation of nine local governments, each being sovereign to all intents and purposes in the fields assigned to it by the B.N.A. Act. These fields often present quite different characteristics from province to province: that is why we are a federal rather than a legislative union. In vital statistics we have achieved a very satisfactory *modus vivendi* on this principle. Only a few years back we had eight or nine different vital statistical acts in Canada; as many different series of schedules appended to these acts; as many different degrees of enforcement; as many different ways of compiling the statistics; and as many different methods of publication—indeed publication was intermittent or non-existent in certain provinces. You could not satisfactorily compare province with province or add up a Dominion total. More, you could not compare vital statistics with migration statistics, or reconcile either of these with the Census. Now, population statistics should be a unity, the day-books of which are vital statistics *plus* the statistics of migration, whilst the stock sheet is the Census. These are essentially one: the parts should be brothers, like Huz and Buz, of whom the only fact that Genesis thinks worth recording is that Huz was the brother of Buz. Brothers these branches of statistics now are, thanks to our conferences back in 1918 and the subsequent co-operation of the several provinces. Other social statistics, like institutional, educational and criminal statistics, have likewise been related. It is all an old story now, but I know of nothing that more conduces to a clear understanding of our social problems. Of course we have the inspiration of a great history. Quebec had birth registrations three hundred years ago, when few thought such things of any account; and of course Talon in 1666 took the first Census of the modern kind: never may we cease boasting about it.

But it is forward and not back we must look in this year of 1938. Vital statistics during the past seventy or eighty years have pointed the way to progress in the attack upon disease and death to such an extent that we have cut the death rate in two—which is only the beginning of "back to Methuselah" in

medicine. To-day, as it happens, notwithstanding the continuance and intensification of the fight against disease, it is the declining birth-rate that is making the headlines. Just what it portends is as yet hard to tell, but unquestionably it means much. A stationary or declining population has implications of the most far-reaching and ubiquitous kind, social and economic. Even the moral point of view is affected. Thrift, for example, is a virtue in a mounting population: it is a very different thing in an era of decline. But listen to J. B. S. Haldane:

"The moral and physical (though not the intellectual) virtues are means between two extremes. They are essentially quantitative. It follows that an alteration in the scale of human power will render actions bad which were formerly good. Our increased knowledge of hygiene has transformed resignation and inaction in face of epidemic disease from a religious virtue to a justly punishable offence."

Still, the monastic orders (the Benedictines and Franciscans particularly), who preached this resignation, were the homes of mediaeval medicine.

The two most important problems that face us at the moment officially have to do with (1) morbidity statistics, and (2) the revision of the international nomenclature of the causes of death. Morbidity figures are coming forward in leaps and bounds with increasing health insurance and medical relief. We have only to look at our hospital figures and the 1931 Census to realize their importance. Last year, 840,000 persons were admitted to hospitals for the sick in Canada; in the 1931 Census, out of about a million persons classified as wage earners, 112,000 lost 1,400,000 weeks through illness. Other records are multiplying. The Department of Pensions and National Health, for example, is making some valuable analyses of the sick-leave records of the Civil Service. No time should be lost in ensuring uniformity of statistical treatment in this field, and I am glad to know that the committee appointed on this subject by the Dominion Council of Health some time ago will make a report at the present sessions of this Section that should do much to clear the air. The subject will come up at the Conference called for October next at Paris for the revision of the International List of Causes of Death, to which I just referred. This meeting, by the way, will discuss, in addition to its main subject, several others of great interest internationally. We have in fact reached a stage in vital statistics where, in the words of Nurse Cavell, "patriotism is not enough"—where the whole world must be our parish, where completeness of registration, uniformity of definition, adequacy of analysis, and comprehensiveness of publication in other countries are almost as important to us as are our own methods and figures. We have our Canadian ideas for the Paris Conference well in hand. There have been committees at work, both of the Canadian Public Health Association and of the American Public Health Association, and as between our Bureau and the provinces, with due liaison, and when we go to Paris in September next it will be after a full canvass of the situation and its needs. I think we will be able to make a contribution to the discussion. The 1928 Conference suggested some notable improvements, which were adopted for Canada in 1931, and undoubtedly the present year will witness a no less worth-while advance.

We are living in an era in which statistics and statistical approaches upon

problems are multiplying more rapidly than at any other time. This is due to two things. Firstly, there is an increasing dissatisfaction with a merely theoretical attack upon social problems: the demand to-day is for factual, inductive reasoning, a subject on which I would like to enlarge, but this is not the time or place. Medicine, born in Greece, all but perished when Roman slave labour divided the mental from the manual and, for a thousand years, handed over diet to the nurse, *materia medica* to the apothecary, and anatomy and surgery to the barber. These are all "medicine" to-day. Secondly, there has been a rapid advance during the past few years in statistical technique—and progress in science is no faster than the invention of new techniques. Population is perhaps the field that has chiefly witnessed improvement. Two of the greatest of statistical pioneers, Karl Pearson and R. A. Fisher, have worked primarily in biology,—and of course Quetelet himself, the father of modern statistics and a re-maker of human thought if ever there was one, dealt with the human element in his "*Physique Sociale*", of which last year was the centenary. More recently Lotka has given a new precision to certain types of speculation as to population growth, so that we are able for the first time to understand its real nature. In our own Bureau we have been able to analyse the 1931 and 1936 Censuses on a scale never before attempted, and some of these results are now appearing in the shape of monographs on different phases. One of these just published presents the first official life-table to be made for Canada. That is an important milestone, but even more important I am inclined to think are the short-cuts that are being invented for constructing such life-tables. By one of these, a life-table can be made up with approximate accuracy for a given locality in about as many hours as it used to take weeks. The implications this has for vital statistics need not be stressed. Finer methods for the measurement of fertility and mortality rates are other advances to be mentioned. But let me ramble still further afield.

There is a book recently off the press of the Lancet publishers in Great Britain which I can commend to any of the present audience who may not yet have seen it. It is entitled "*Principles of Medical Statistics*", and its author is A. Bradford Hill, Reader in Epidemiology and Vital Statistics in the University of London. It contains a general and first-rate discussion of its subject, but a point it makes which I want to emphasize is this: The interest of the medical profession in statistics to-day is not confined to vital statistics—that is, doctors should not be taught statistics merely to enable them to send in good birth and death reports, or even to read, interpret and apply intelligently the resulting official vital statistics. Doctors should have a general knowledge of statistical science and technique with a broader purpose altogether, namely, to enable them to generalize scientifically the meaning of their own experience. It is very easy to mistake just what actually happens when, say, a new method is used in treating numerous cases each of which has characteristics of its own. Where trains of causation are complex, common-sense is not enough to bring to bear: only statistical analysis can definitely disentangle multiple causation. Bradford Hill says:

"Mistakes which, when pointed out, look extremely foolish, are quite frequently made by intelligent persons, and the same mistakes or types of mistakes crop up again and again.

There is often lacking what has been called a statistical tact, which is rather more than simple good sense. That tact the majority of persons must acquire (with a minority it is undoubtedly innate) by a study of the basic principles of statistical method."

He gives examples that are calculated to make fidgety a potential lay patient like myself.

In the last issue of the *Journal of the Royal Statistical Society* is an article on a somewhat related theme. In Great Britain at the moment, as here, considerable attention is being given to the problem of malnutrition in school children. The best way to diagnose malnutrition appeared to have a doctor give the children a thorough personal examination. But this was expensive, and at that did not furnish the final word. For instance, when a doctor segregated of a certain school, say, 6, 8 or 10 per cent. who appeared under-nourished, some of these did not subsequently respond to treatment. In other words, it was not malnutrition that really ailed them. Now, it was found that when certain physical and physiological measurements of the children were made, analysed and cross-classified in an approved way, a smaller proportion of the segregated children failed to respond to the improved feeding. Though the tests are by no means final, it appears to be indicated that at least the two methods should go hand in hand. I commend a careful following of these experiments to all who are interested.

Vital statistics,—the branch of statistics which it is the special purpose of our section to improve,—is truly one of the great divisions of statistics in general, and with the repetition of the banality I may draw to a conclusion. Statistics begin and end with population. Economic statistics are supplementary. Well may that be. We reckon the national wealth of Canada in material things at, say, \$25 billions. But Dr. Dublin has estimated the economic value of a man capable of making \$2,500 a year, as \$9,000 at his birth, as \$25,000 at age 15, and as \$32,000 at age 25. The female of the species is more deadly than the male but according to Dr. Dublin she is "worth" only about half as much. In Canada the chance at age 13 for every male is that he will earn \$37,017; and for every female \$4,481 (this includes wives and homemakers who don't "earn" anything). If you work out our population values on this basis, you get an astonishing figure—four or five times that for our material wealth. No wonder the old prejudice against population statistics has died away. You will remember that in the First Book of Chronicles we are told that "Satan stood up and moved David to number Israel." David's Census (about 1000 B.C.) provoked the Divine displeasure, and led to very disastrous consequences. In fact, David was given the option, for punishment, of falling into the hands of his enemies or of having a pestilence visit his people. David, as is evidenced by his love of statistics, was a man of common sense, and he elected for the pestilence—and some 70,000 of his people died. That was a body-blow for statistics, but would you believe it that the effects lingered for over 1500 years in Christian Europe, and that as late as 1753 the taking of a Census was condemned on religious grounds in the British House of Commons by a member who declared that he "did not believe there was any set of men, or indeed any individual of the human species so presumptuous or so abandoned as to make the proposal we have just

heard." That sort of thing is mostly past and gone, though we had a slight repercussion last year when certain questions proposed by the Registrar General of Great Britain on the fertility of marriage were denounced by Mr. A. P. Herbert, M.P., as reducing women to the status, as he put it, "of cattle". Mr. Herbert is, of course, a humorist—at any rate he is one of the editors of *Punch*—and he is still apparently of the opinion of Ecclesiastes on embryology. On the other hand, it was to the practical common sense of Florence Nightingale, a nurse, that we owe one of the great advances in the study of statistics, namely, the establishment of a Chair of Statistics at Oxford University nearly half a century ago. It was a letter of hers to Sir Francis Galton (quoted by Pearson in his *Life of Galton*) that set this in train. Florence Nightingale was emphatically not "the Lady of the Lamp" which the emotionalists have conjured up. She was first and foremost a great administrator, a woman who knew her mind and got things done—essentially therefore a disagreeable person, as Strachey has demonstrated. This came from her being a friend and disciple of Quetelet: there is still preserved her presentation copy of the *Physique Sociale*, underscored and annotated by her own hand throughout. To her, statistics were more than a study: they were, in her own words, a religion. Pearson calls her "the passionate statistician". Following her precept, we now have some good teaching of statistics in certain of our Canadian universities. It is significant that with the creation of the School of Hygiene in the University of Toronto a new department of the university was organized to provide instruction in the fields of epidemiology and biometrics. There is, however, no Chair of General Statistics in any Canadian university and it is the melancholy fact that four or five Canadian universities still do not know the word statistics in their curricula. This, we may be sure, will be corrected in time and I believe that the spear-head upon public opinion for progress in this regard will be our continuing demonstration of practical achievements in vital statistics.

The Seventh Annual Christmas Meeting

of the

LABORATORY SECTION

will be held in the

Royal York Hotel, TORONTO

DECEMBER 19-21, 1938

Erythema Nodosum and Tuberculosis

K. F. BRANDON, M.D., D.P.H.,¹ R. P. HARDMAN, M.D., D.P.H.,²
AND W. H. BIRKS, M.D.³

AN epidemic of erythema nodosum appeared in a boys' school in the spring of 1936, 13 cases occurring within seven weeks. Before this investigation had been completed a fourteenth case had occurred. The school consisted of 173 boys. The staff did not recall the occurrence of cases of the disease in past years and the school medical records did not record any.

From January to May there had been 8 cases of rubella. Two of the boys had suffered an attack of rubella two months before they had erythema nodosum. At least 9 boys had been treated for tonsillitis during the period of January to April but did not suffer later from erythema nodosum. There were no other illnesses in the school at this time.

The school was situated on a 300-acre farm with widely-spaced buildings. On April 1, 1936, there were 173 boys, 10 to 19 years of age, and a staff of 35 persons. The boys slept in five cottages, each with a capacity of 42. In each of the cottages most of the beds were placed in one large room, with three-foot spacing. The cottages were well lighted and ventilated. Each was supervised by a man and his wife who lived in quarters adjoining the main sleeping-room. Showers, toilets and wash-basins were adequately provided in separate, easily-accessible rooms.

The dining hall consisted of one large room where the boys and all the staff had their meals at the same hour. Tables seating 5 boys were used and the staff had a separate large table. Food was prepared in the same building and was carried to the tables by the boys. Dish-washing was done by hand and towels were used for drying. The kitchen and dining-room staff consisted of 2 adult chefs, a woman who supervised the dining-room, and a group of boys. Almost all the boys served in turn in the kitchen and dining-room.

Each boy received academic training. Instruction was given in various class rooms. In addition, vocational training was provided for those who were able to keep up with the academic work. On April 1st, 22 boys were working part-time in the fields and stables, the work including the milking of cows; 14 boys were assigned to the green-houses and gardens of the school; 23 boys spent part of each day at wood-working; 11 boys worked in the metal shop; and 30 boys, 15 in the morning and 15 in the afternoon, worked in the leather shop. In addition a few were employed in vocational training as tailors, barbers, office boys and engineers in the power house. These shops allowed intimate contact and opportunity for cross-infection of boys from different class rooms and living quarters.

¹Research Assistant, Connaught Laboratories (Western Division), and Epidemiologist, Metropolitan Health Area of Greater Vancouver, Vancouver, B.C.

²Epidemiologist, Division of Preventable Diseases, Department of Health of Ontario, Toronto.

³Medical Officer of Health, Bowmanville, Ontario.

A definite schedule of physical training was carried out. The boys had gymnasium classes during the day and each cottage was assigned an evening a week in the gymnasium. The day classes allowed contact of the inmates of the various cottages. The gymnasium was equipped with a swimming pool in which the water was filtered and chlorinated. A common locker room was used.

The school was supplied with water from deep drilled wells and did not require filtration or chlorination. Septic tank installation with tile distribution beds was used for the disposal of sewage.

The school was supplied with milk from a tuberculin-tested herd kept on the farm. The cows had been tested ten months previously and had been found negative. Several tuberculin-negative cows had been added to the herd since the testing. The milk was pasteurized in a vat in the kitchen under the supervision of one of the chefs.

THE OCCURRENCE OF ERYTHEMA NODOSUM

The first case of erythema nodosum occurred on February 29th. Between that date and April 19th, 13 cases were reported. An additional case occurred on May 21st.

TABLE I
DATA ON 14 CASES OF ERYTHEMA NODOSUM

Case No.	Age	Onset	Living quarters	Work	Tuberculin Test	X-ray Findings May 11, 1936
1	14	Feb. 29	N	Wood	May 7+	Lesion*
2	15	Mar. 10	J	Horticulture	Apr. 17+	Suspicious
3	15	Mar. 13	N	Tailor	May 7+	Lesion*
4	16	Mar. 18	N	Leather	May 7+	Lesion*
5	14	Mar. 19	N	Leather	May 7+	Suspicious
6	13	Mar. 19	N	Horticulture	Apr. 17+	Negative
7	11	Mar. 30	S	Full-time school	May 7+	Suspicious
8	13	Mar. 31	N	Leather	May 7+	Suspicious
9	16	Apr. 3	N	Metal	May 7+	Suspicious
10	13	Apr. 4	N	Wood	May 7+	Suspicious
11	10	Apr. 5	S	Full-time school	May 7+	Suspicious
12	13	Apr. 9	S	Full-time school	May 7+	Suspicious
13	13	Apr. 19	S	Wood	May 7+	Lesion*
14	16	May 21	G	Metal	Apr. 17- May 26+	Negative (May 28)

*Childhood type (hilar gland) tuberculosis.

It is seen from table I that the patients were from 10 to 16 years of age. The first patient was a boy 14 years of age living in cottage N, who worked in the carpentry shop. The second patient, 15 years of age, was the only case in cottage J. He carried meals to case no. 1 during the latter's illness. The onset of his illness occurred 10 days after case no. 1 became ill. In the following week, 4 cases occurred in cottage N. On March 30th, one month after the first case, a boy aged 11 years in cottage S developed the disease. Within three weeks 3 other cases occurred in cottage S. Thus 8 cases occurred among the boys in cottage N, where the first case appeared; one case in cottage J, which accommodated older boys, age 14 to 17 years; and, at a later date, 4 cases in cot-

tage S. It is of interest that only one case occurred in cottage J. With the reporting of the fourth case among the boys in cottage S on April 19th, the epidemic was considered to have ceased. One case appeared a month later in cottage G. No cases were reported in cottage K. In table II the attack rates for the various cottages are presented.

TABLE II
ERYTHEMA NODOSUM
ATTACK RATE ACCORDING TO COTTAGES

Cottage	Number of boys	Number with erythema nodosum	Definite or suspicious lesions (tuberculous)
N	39	8 (21%)	7 (87%)
S	41	4 (10%)	4 (100%)
G	29	1 (3%)	0
J	30	1 (3%)	1 (100%)
K	34	0	
Total.....	173	14 (8.9%)	12 (85%)

CLINICAL OBSERVATIONS

The first case occurred in cottage N on February 28th. The patient presented, on the extensor surfaces of the legs and forearms, swellings typical of erythema nodosum. A few lesions were seen on the face and on the extensor surfaces of the thighs. These nodules were slightly elevated, dusky red, and varied in diameter from 1 cm. to 5 cm. They were slightly tender but not painful or itchy. With the exception of an increase in temperature (102° F.) and pulse

TABLE III
CLINICAL DATA ON FOURTEEN CASES OF ERYTHEMA NODOSUM

Case No.	Date of Appearance of Nodules	Temperature Range	Temperature Normal	Special Features
1	Feb. 28	98 —104	5th day	Repeated severe nodules. Mar. 10th in bed, synovitis of right knee followed by synovitis of left knee and left ankle.
2	Mar. 10	98 —101	18th day	
3	14	97.6—103	22nd day	
4	18	99 —101.8	15th day	
5	18	99 —100.2	10th day	
6	25	98 —100.8	8th day	
7	28	99 —100.2	10th day	Relapse on the 12th, 13th and 14th days. Normal on the 15th.
8	30	98 —103.6	10th day	
9	31	98.2— 99.4	3rd day	
10	Apr. 3	98.0—102.8	16th day	
11	5	98.0—102.0	13th day	
12	9	99.0—106.0	8th day	
13	21	99.0—104.8	9th day	
14	May 18	99.0—104	10th day	

rate, the physical findings were otherwise negative. On March 3rd his temperature was 104° F. On March 5th the boy was admitted to hospital. During the following days his temperature ranged from 98 to 101° F., falling to normal on the fifth day. The pulse rate varied between 70 and 110, corresponding to the elevation of temperature. At the same time the nodules began to subside and to fade. A subcutaneous staining persisted for weeks. The patient was discharged from hospital on the seventeenth day.

The second patient, who became ill on March 10th, presented similar symptoms. His temperature reached its highest point (101° F.) on the 15th day and fell to normal on the 18th. This boy had carried food to patient no. 1 during the first days of the latter's illness. White blood counts on these cases at the height of the fever were 10,500 and 11,000 respectively. Differential counts were not made.

Table III presents the clinical features of the 14 cases.

Tuberculin tests were done, as will be described below. All the above patients showed very severe reactions to an intradermal injection of 1/20 mg. of old tuberculin.

LABORATORY INVESTIGATIONS

Blood samples were taken from six patients during the febrile stage. Routine blood cultures failed to reveal the presence of any micro-organism. Agglutination results were negative for *B. typhosus*, *B. paratyphosus A* and *B. B. tularensis*, and *Brucella abortus*. The blood of patient no. 14 was obtained on the second day of his illness when he had a temperature of 101° F. and 10 cc. was inoculated into guinea-pigs. After three months the guinea-pigs showed no evidence of tuberculosis. Blood sera were submitted to the laboratory of the Department of Pensions and National Health at Christie Street Hospital, Toronto, for tuberculosis complement-fixation and inhibitive tests. Examination of samples of sera taken at suitable intervals showed changes in the complement-fixation and inhibitive titres in several cases. These serological findings were interpreted as signifying clinically active tuberculosis.

A pathological section of skin was obtained from patient no. 14 on the third day of his illness, the section being made through a nodule over the tibia which had appeared about 48 hours before. The following is a report of the section stained with eosinmethylen blue:

"The section through the skin showed a normal epithelium but marked pathological changes were found in the corium. All the blood vessels of the corium appeared dilated and engorged with red blood cells. These vessels were surrounded by narrow bands of dense infiltration of lymphocytes and polymorphonuclear leucocytes. Examination of the vessels showed greatly thickened vessel walls, and the infiltration in places penetrated the vessel walls. Small haemorrhages resulted at these points. The lymph spaces in the perivascular areas of the corium were to some extent dilated. The pathological changes were remarkably limited to the blood vessels themselves and to their immediate neighborhood, suggesting that this disease is due to something carried by the blood stream. Verhof elastic tissue stain revealed no abnormalities in that tissue. Connective tissue stain of the sections showed proliferation of fibro-blasts in the perivascular areas. Serial sections of the nodule were stained by the Ziehl-Neelsen method and carefully searched for acid-fast bacilli without success."

Although the tubercle bacillus was not isolated from the blood or from the nodules, the complement-fixation and inhibitive reactions were very suggestive in at least 6 of the 11 patients whose sera were studied.

Throat swabs were examined for the presence of haemolytic streptococci. Ten patients were studied and haemolytic streptococci were found in three. Two of these were identified as the human pathological type. Sore throat had been reported by only 2 of the patients during the onset of their illnesses and these 2 were not harbouring haemolytic streptococci.

Tuberculin Tests

Tuberculin tests were made on a total of 158 of the 173 boys as well as the members of the staff. This number represented all who were living in the school before April 1st and who were present during the epidemic. The majority had been in the school for from four months to a year. A few had been in the school for considerably longer periods. Two different doses of tuberculin were used, the first 1/20 mg. in 0.02 cc. Those who did not react to this dose were given 1 mg. in 0.1 cc. The readings were made in twenty-four hours and redness of 5 x 5 mm. or more was considered a positive test. The data are presented in table IV. In cottage N, where most of the cases of erythema nodosum occurred,

TABLE IV
TUBERCULIN TESTS ACCORDING TO COTTAGES

Cottage	No. of boys	No. tested	Pos. to 1-20 mg.	%	Pos. to 1-20 or 1 mg.	%	Roentgenographic lesions			
							Definite	Suspected	Total	%
N	39	37	31	84	35	95	5	5	10	27
S	41	40	17	42	31	77	4	4	8	20
G	29	22	14	64	20	91	2	0	2	9
J	30	26	22	85	24	92	2	1	3	9
K	34	33	25	76	29	88	2	3	5	15
Total...	173	158	109	69	139	88	15	13	28	18

95 per cent. of the boys were tuberculin-positive. In cottage S, where the attack rate was 10 per cent., 77 per cent. of the boys reacted to 1 mg. of tuberculin. In the other three cottages the percentages positive to tuberculin were from 88 to 91.

The tuberculin tests were made on May 7th. Among those who were found tuberculin-negative, 4 had been resident in the school for from 13 to 19 months, 6 for 7 to 11 months, 4 for 2 to 6 months, and 4 for 6 weeks. It will be noted from the table that the incidence of positive reactions to tuberculin was very high considering the age of the boys—10 to 19 years. Taking the group as a whole, the average was 88 per cent. when 1 mg. was used. Using 1/20 mg. the percentage of positive reactors was 69. If the testing had been done with only 1/20 mg., 19 per cent. of the reactors would have been missed.

In considering these findings, a comparison has been made in table V of the data obtained by McPhedran and Opie (1), who studied the results of tuberculin tests made on male contacts of different ages in Baltimore homes where

there were: (1) open cases of tuberculosis, (2) cases with no tubercle bacilli in sputum, (3) members with suspected tuberculosis, (4) no cases of tuberculosis.

TABLE V
TUBERCULIN TEST RESULTS OF MCPHEDRAN AND OPIE
COMPARED WITH THOSE IN COTTAGES N AND S

Males Age	Per cent. Positive				Cottage N	Cottage S
	(1)	(2)	(3)	(4)		
10-14.....	84.5	64.3	64.9	48.4	}95	77
15-19.....	98.9	89.1	92.0	82.1		0

(1)-(4): Figures of McPhedran and Opie.

As previously stated, 77 per cent. of the boys in cottage S (10 to 14 years) were tuberculin-positive. In cottage N the ages ranged from 13 to 16 years. The percentage of positive reactors found in the school was similar to that occurring in homes where there are open cases of tuberculosis.

All the boys who were tuberculin-positive were given a roentgenographic examination of the chest on May 18th. Twenty-eight persons had demonstrable lesions (table IV). Five were considered to have the minimal adult type of lesions. One of these had dry tuberculous pleurisy (three months later this boy showed a moderately advanced lesion with pleural effusion). Another had a pleural effusion in the following August. Eight presented the childhood type of lesion (four of these had had erythema nodosum within 10 weeks of this examination). Thirteen were considered as having possible active lesions. The greatest number of active and suspected tuberculosis cases occurred in cottages N and S, where the erythema nodosum attack rate was highest, but it is seen in table IV that every cottage contributed active cases. No case was found to have tubercle bacilli in the sputum.

A number of the boys had been tuberculin-tested as part of the routine examination on admission to the school. Eleven boys who were non-reactors to 1/20 mg. one to two years previously, had become reactors to this amount during their stay in the school. Only one of these had suffered from erythema nodosum. One other erythema nodosum case was very interesting. This was the last boy, F., living in cottage J, who was tuberculin-negative on April 17th, 1936, and one month later, on May 21st, he developed erythema nodosum. On the fifth day of his illness the tuberculin test, using 1/20 mg., gave a very large reaction. In this patient the same lot of tuberculin and the same dosage were used both before and after his attack of erythema nodosum. Here was a patient who a month before an attack of erythema nodosum was tuberculin-negative and during his attack reacted very severely to tuberculin.

The tuberculin reactions of the patients with erythema nodosum were conspicuously large, measuring in most cases over 20 x 30 mm. (24-hour reaction) when 1/20 mg. of tuberculin was used. Most of these patients developed vesicles at the site of injection. The patients would certainly have been rendered ill had 1 mg. been used in the tests.

Of 22 boys aged 9 to 16 who were admitted after April 1st and tested on May 18th, 14 (64 per cent.) were tuberculin-positive. Eight of these 14 tuberculin-reactors were negative to 1/20 mg. but positive to 1 mg.

It was apparent at this stage of the investigation that the school population had been recently highly sensitized to tuberculin. Therefore a search was made for open cases and active cases of the disease in the community. The staff and all other persons in the school were tuberculin-tested and if positive, X-ray examination of the chest was done. No cases were found. However, an open case of tuberculosis had been removed from the school on April 6th. This boy, 17 years of age, had been admitted in December, 1934, and, it was later found, came from a family whose mother had died of tuberculosis in 1933 and a sister in 1935. The father and three other children in the family were in a sanatorium with active pulmonary tuberculosis, all being open cases. This boy was tuberculin-positive in January 1935 and had a chest examination at that time and his X-ray findings showed thickened linear markings and some slight shadowing in the apex of the left lung. This boy had been living in cottage J for three months prior to his discharge on April 6th. He had probably been in contact with most of the boys in the school. One of the boys who slept in the same room as this boy developed erythema nodosum on March 10th.

DISCUSSION

This outbreak of erythema nodosum in a boys' school involved 14 boys in a population of 173. All 14 were found to be highly sensitive to tuberculin and 12 showed definite or suspicious evidence of active pulmonary tuberculosis. Besides this, ten cases of minimal tuberculosis were found and a further five suspected cases of pulmonary tuberculosis. It was interesting that all the positive tuberculous lesions among the cases of erythema nodosum were of the childhood or hilar-gland type. The source of the epidemic was probably the boy who was diagnosed as an open case five weeks after the first case of erythema nodosum had occurred. The disease was probably transferred by direct contact. There are, however, other possibilities of transmission of the disease, such as the swimming pool. The first eight cases may have been infected by the open case living in cottage J but there is a definite history of case no. 2 attending case no. 1 during his illness and after ten days no. 2 developing erythema nodosum. Assuming that erythema nodosum in this epidemic was caused by *M. tuberculosis*, was it possible for an active case of erythema to spread *M. tuberculosis*? Wallgren (2) reports the demonstration of tubercle bacilli in children with erythema nodosum. He proceeded in the following manner:

"The day before the examination the child was given potassium iodide in order to make the eventual mucus more soluble. Before breakfast on the following morning the child was ordered to cough for several minutes. Then the stomach was washed out with 200 cc. of a physiologic solution of sodium chloride. The material was centrifugated and the sediment injected into guinea pigs."

In this manner he was successful in obtaining tubercle bacilli from 17 of 37 cases who reacted positively to tuberculin. In the same article he comments on

the roentgenological findings on positive tuberculin reactors suffering from erythema nodosum. In no case was there any picture resembling ordinary pulmonary tuberculosis, but 21 showed enlargement of the hilar shadow. He emphasizes the observation that children with erythema nodosum often spread tuberculosis and that they should be isolated from other children to protect the latter from contamination. Several others have demonstrated tubercle bacilli by gastric lavage in cases of erythema nodosum (3, 4).

If Wallgren's observations apply, an explanation is offered of the further spread of the disease after the removal of the open case on April 6th. On the other hand, is it possible that the incubation period or development of allergy to tuberculosis in the case of patient no. 14 required six weeks after exposure to the open case discovered on April 6th?

Ernberg (5) emphasizes that erythema nodosum appears in a fresh tuberculous infection at the peak of the allergic condition. Wallgren (6) has found that before pyrexia commences the organism has not reached that degree of tuberculin sensitivity which it rapidly attains just at the outbreak of the "nodal fever". The time between tuberculous infection and allergy may be considered the real period of incubation. He believes that erythema nodosum ought to be considered the exanthema of tuberculosis. He does not think that the nodes are foci of tuberculous infection, never having been able to demonstrate the bacillus in pathological sections or in the blood. Ernberg and Wallgren agree that the disease represents the height of the allergic state in tuberculosis.

On the other hand, Forman and Whitwell (7) of Guy's Hospital give the probable course of events as follows:

"A primary inoculation of tubercle bacilli occurs, usually in the respiratory tract, but occasionally in the skin or elsewhere. After some weeks the body becomes highly allergic to tuberculin, and should by some chance small numbers of tubercle bacilli enter the blood stream and lodge in the tissues they will by their presence set up an acute reaction in which they are destroyed. If the numbers of bacilli in the blood are numerous, although erythema nodosum may occur early on, the final result is likely to be a miliary tuberculosis and a depressed sensitivity to tuberculin. We suspect that the same depression may subsequently occur in those cases of erythema nodosum in which there are severe constitutional symptoms or an unusually large number of nodes or a few very intensely inflamed nodes or a severe sore throat."

Arena (8) was able to culture the tubercle bacillus from 5 cases using pulverized nodules treated for 20 minutes at 37° C. with 5 per cent. sulphuric acid and cultured in the media of Lowenstein (1930), Petroff, Dorset, Lubenan, Huntoon and Besredka. He demonstrated the tubercle bacillus also by injection of nodular tissue into guinea-pigs.

Several observers (9, 10) claim to have isolated the tubercle bacillus from the blood of cases of erythema nodosum.

Ernberg has numerous references to phlyctenular conjunctivitis and other early tuberculous manifestations occurring with erythema nodosum (5). The same author was able to trace a case of pulmonary tuberculosis in an infectious stage in the erythema nodosum patient's environment. He states that:

"This symptom complex is a link in a chain of pathological processes which as a rule become manifest at an early stage of the tuberculous disease, a stage at which one would otherwise in many cases be ignorant of its existence."

Much has been written about the association of erythema nodosum and tuberculosis but very few epidemics have been described. Aguirre (11) describes an epidemic of the familial form, reporting 12 cases. Begg (12) experienced a ward outbreak of 4 cases of erythema nodosum, the first case occurring 8 days after a child on the ward had died of acute miliary tuberculosis. These 4 cases all had strongly positive Mantoux tests. Giertsen (13), over a ten-year period, studied 93 cases in a hospital in Bergen, using X-ray, von Pirquet and blood sedimentation tests. Nearly all proved to be early cases of tuberculosis. De Murtas (14) describes an epidemic in a school in Italy where 17 persons out of 98 in the total school population were attacked. In almost every case the eruption was preceded by an attack of tonsillitis, the interval between being about a week. The ages of the patients varied from 6 to 20 years. The von Pirquet reactions in all were positive and in every case in which a radiological examination was possible signs of hilar disease and tracheo-bronchial adenopathy were found, and two patients developed a pleural effusion two months after their attack of erythema nodosum.

SUMMARY

The occurrence of 14 cases of erythema nodosum among 173 boys in a residential school during a period of seven weeks is recorded. The boys were from 10 to 19 years of age. All the cases of erythema nodosum occurred among boys 10-16 years of age. Tuberculin-testing of 158 boys, using 1/20 mg. and 1 mg. of old tuberculin, showed an incidence of 88 per cent. positive reactions. Of the 14 cases, 12 were considered as either definite or suspicious cases of tuberculosis. Only one open case of tuberculosis was found in the school, the case being transferred to the sanatorium. By that time, 11 cases of erythema nodosum had occurred. In cottage N, where most of the cases of erythema nodosum occurred, 95 per cent. of the boys were tuberculin-positive. Contact was possible in the dining hall, shops, gymnasium, and swimming pool. Only two of the cases of erythema nodosum had suffered an illness during the preceding months. These two cases had suffered from rubella in the preceding months but none of the cases gave a history of tonsillitis during the immediately preceding months. Students and staff were tuberculin-tested and roentgenographic examination of the chest made. A total of 28 persons showed demonstrable lesions. In none of the 28 persons were tubercle bacilli found in the sputum.

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Undulant Fever in Edmonton, Alberta

G. M. LITTLE, M.D., D.P.H.

Medical Officer of Health

STUDY of available medical and veterinary literature suggests *Brucella abortus* infection in both man and cattle as an increasing problem on this continent. It also indicates the incomplete state of our knowledge regarding the epidemiology of this infection. The apparent immunity of both children and calves to this organism, the inconsistency of its attacks upon man, the areas in which dairy herds are found heavily infected with apparently no human infection—these and other circumstances have not been satisfactorily explained.

It can hardly be doubted, however, that the infection may be transmitted to man both through close contact with infected cattle and through infected milk from these animals. While the human death-rate from this source is low, a period of disability ranging from a few weeks to many months ranks it with problems demanding continued study. Nor is there much comfort to be derived from the fact that the variety of *Brucella* which commonly infects cattle is less virulent to man than those varieties found infecting goats and hogs. Indeed, the United States Public Health service states "The situation is complicated, however, because in localities where cattle are associated with infected goats or hogs, they may become infected with the caprine or porcine variety of the causative organism, and transmit it to man with all its original virulence."* It seems possible that adaptation of these varieties of *Brucella* to our dairy cattle may in some degree explain the variability in virulence of the infection in cattle toward man. As previously stated, there has not been any satisfactory explanation of why milk-borne cases of the infection in man appear in one community while another community whose dairy cattle are known to be heavily infected seems to escape human infection.

During the year 1937 and the month of January, 1938, ten cases of undulant fever were reported in the city of Edmonton. This constituted a considerable increase in reported cases of this disease, as only two cases had been reported previously in the city, one in 1933 and the other in 1936. No cases were reported from May to August, inclusive. The ten cases occurred during the remaining months of the year.

Clinically all cases in table I were undulant fever. Unfortunately no agglutination test was done on case no. 7, but this case was reported by a physician who attended two of the other cases, both of which were confirmed by bacteriological examinations.

The blood serum of case no. 10 gave a persistently negative agglutination test with *Brucella abortus*, but clinically the case was undulant fever and

*U.S. Treas. Dept., *Public Health Reports*, 1938, Vol. 53: 1196.

Brucella abortus was identified in a sample of the milk supply used by this case.

It will be noted that only one patient had contact with livestock or raw meats, but all were users of raw milk which was obtained from seven different dairies. Three patients used both raw and pasteurized milk supplies.

TABLE I
UNDULANT FEVER, EDMONTON, 1937 AND JANUARY, 1938

	Sex	Age	Occupation	Handled Livestock, Raw Meats	Milk Used		Agglutination Br. abortus
					Raw	Pasteurized	
1.	F	17	School.....	No	Yes	Yes	1:3200
2.	M	23	Dry-goods clerk	No	Yes	No	1:12800
3.	F	22	Dry-goods clerk	No	Yes	Yes	1:3200
4.	M	67	Rental agent.....	No	Yes	No	1:800
5.	M	44	Business agent.....	No	Yes	No	1:400
6.	M	26	Unemployed.....	No	Yes	Yes	1:3200
7.	M	16	School.....	No	Yes	No	not done
8.	M	20	Retail meats.....	raw meats	Yes	No	1:25,600
9.	M	48	Lawyer.....	No	Yes	No	1:1600
10.	M	45	Clergyman.....	No	Yes	No	Negative

The above information obviously suggested raw milk as the source of the infection. Raw milk constitutes 23 per cent. of the milk retailed in Edmonton, and is distributed by 51 producers. Seventy-seven per cent. of our supply is pasteurized, and as the evidence seems satisfactory that pasteurization prevents the transmission of viable *Brucella* organisms through milk, the pasteurized product was given no further consideration.

The simple and effective solution of the problem, pasteurization of our whole milk supply, was impossible for the time being, owing to local circumstances. It was decided therefore to demand, as empowered by the Provincial regulations, that the agglutination test for *Brucella abortus* be applied to all dairy herds from which raw milk was delivered to our city, and that positive reactors be removed immediately from these herds.

This was not accomplished without some opposition, as many of our dairymen had still in mind losses sustained when the tuberculin-testing of cattle was introduced; and in the present case no compensation was offered. In this connection it seems evident that the government of our Dominion must assume the responsibility of dealing with this problem of *Brucella* infection, as they have so ably done with that of bovine tuberculosis, on both the grounds of protecting their citizens and of preventing the present grave economic loss to the dairy industry. At the present time cattle for dairy purposes cannot be exported to Great Britain or United States unless certified as free from *Brucella abortus*. There was nothing, however, to prevent reacting animals from being sold for slaughter, and, as this market was fairly good at the time, the co-operation of all dairymen was eventually obtained. Our Local Board of Health, with the generous assistance of the Provincial Laboratory, arranged to have the initial testing done without cost to herd-owners. These tests were completed in April, 1938.

In the testing of cattle bloods an agglutination titre of 1:200 or greater with *Brucella abortus* was considered a positive reaction. Certain laboratories on this continent have set a titre of 1:100 as their yardstick for a positive reaction, but considering the still rather indefinite state of our knowledge of this problem, it was thought advisable to consider a titre of 1:200 the lower limit of positive reaction for this initial test. Titres of 1:100 to 1:200 were classified as suspicious, as were also titres of 1:50 to 1:100 if other definitely positive reacting animals were found in the same herd. Otherwise, titres below 1:100 were considered negative.

TABLE II
AGGLUTINATION TESTS OF CATTLE FOR BRUCELLA ABORTUS

Herds tested.....	51 (100. %)
with positive reactors.....	26 (50.9%)
with suspicious reactors only.....	7 (13.7%)
with no reactors.....	18 (35.2%)
Cows tested.....	1115 (100. %)
positive reactors.....	134 (12.0%)
suspicious reactors.....	46 (4.1%)
negative reactors.....	935 (83.8%)

In 26 herds containing positive reactors the percentage of positive animals ranged from 2.4 per cent. to 44.4 per cent.

The most lightly infected herd from which a case of human infection was derived contained 10.6 per cent. positive reactors. Dilution of milk from *Brucella*-infected cows by pooling with milk from non-infected animals of the herd is stated to be a proportionate safeguard against transmitting the infection to man through this medium. Chance, however, may readily nullify this protection. The majority of the milk producers in question bottle their milk immediately upon milking, after which the bottles are placed in cooling tanks. Large utensils are not used, so that there is very little pooling of the milk. Although there may be few reactors in a herd, it is conceivable that numbers of bottles could be filled entirely from this source.

Through the kindness of Dr. R. M. Shaw of the Provincial Laboratory, samples of milk from eight herds containing positive reactors were tested by guinea-pig inoculation and *Brucella abortus* identified in five of these samples.

Cows classified as positive reactors were immediately removed from dairy herds, and owners were advised to have suspicious reactors re-tested in six weeks' time. Many owners voluntarily disposed of the latter at once. They were also advised to have new additions to the herd tested as soon as acquired. Our present plan is to re-test these herds a year following the first test. If not hampered by economic considerations, we would shorten this period before the second testing.

No known case of undulant fever has developed amongst our citizens since completion of the above measures. Only five months has elapsed, however, since that time.

Scarlet Fever Immunization*

G. MURRAY FRASER, M.B.

Medical Officer of Health, Peterborough, Ontario

DURING the winter of 1937-38 Peterborough experienced an epidemic of a mild type of scarlet fever. In this community, as in most others, scarlet fever is endemic. It is the type of disease which at one time was called scarlatina and which Colles¹ suggests naming haemolytic streptococcic pharyngitis which may be caused by the same organism and may be a focus of spread for scarlet fever. The following is a report of an epidemic of this mild type of scarlet fever in Peterborough during the winter of 1937-38.

In this epidemic 279 cases and 2 deaths were reported from October, 1937, to June 30, 1938, a case rate of 11.81 per thousand population. It is felt that this represents only part of the total number in the community, as there were doubtless many concealed and missed cases. Prior to this outbreak the incidence

TABLE I
REPORTED CASES OF SCARLET FEVER BY MONTHS
AND SHOWING PERCENTAGE OF AGE GROUPS

	Total	0-4		5-14		15	
		No.	%	No.	%	No.	%
Oct. and Nov., 1937	24	2	8.3	20	83.3	2	8.3
December	28	5	17.9	17	60.7	6	21.4
January, 1938	97	16	16.5	60	61.9	21	21.5
February	51	14	27.4	26	51.0	11	21.6
March	36	4	11.1	22	61.1	10	27.7
April	18	2	11.1	6	33.3	10	55.5
May	19	1	5.3	12	63.1	6	31.6
June	6	1	16.6	1	16.6	4	66.6
Total	279	45	16.1	164	58.8	70	25.1

of scarlet fever had been low. For fourteen years previously the number of cases had varied from 4 to 37. An epidemic of this disease last appeared in 1921-22 when 309 cases were reported.

No attempt at mass inoculation against the disease had been made locally. A few children had been inoculated by family physicians but the number was insufficient to have any appreciable influence on mass immunity as compared with diphtheria for which toxoid has regularly been administered in public and separate schools since 1922. The result was a large fertile field of susceptibles in which the disease spread rapidly.

The first cases reported in October, 1937, were pupils attending the Queen Mary School in the north-western quarter of the city. The disease spread south-

*Presented at the twenty-fourth annual meeting of the Ontario Health Officers Association, Toronto, June, 1938.

¹*Brit. M. J.*, 1937, 1216-18.

ward to the King Edward and Prince of Wales Schools, both on the western boundary, and did not begin to travel eastward until late November when the Central and Queen Alexandra Schools reported cases. It will be noted that these schools are Protestant public schools.

Prior to January, 1938, only three cases occurred in separate-school pupils and all were in the western section. The first cases in Ashburnham were reported in December. This district throughout showed comparative freedom from the disease, only 12 per cent. of the total having occurred east of the Otonabee River. The disease was concentrated chiefly in the west wards where there is a density of population and where 77 per cent. of all cases occurred.

As evidence of the mildness of the infection, only 2 deaths occurred, a rate of less than 1 per cent. Both deaths were the result of pneumonia in adults.

Age and Sex

The youngest reported case was a female infant aged 3 weeks and the oldest a male aged 80 years. Of reported cases (table I), 16.1 per cent. were in the age-group 0-4, 58.8 per cent. in the age-group 5-14, and 25.1 per cent. in the age-group 15 and over. Females showed a greater susceptibility in the proportion of approximately 6 to 4.

TABLE II
NUMBER OF REPORTED CASES IN AGE AND SEX GROUPS

Age	Male		Female		Total	
	Cases	Deaths	Cases	Deaths	Cases	Deaths
0-4	22	0	21	0	43	0
5-9	38	0	47	0	85	0
10-14	41	0	38	0	79	0
15-19	7	0	14	0	21	0
20-24	3	0	14	0	17	0
25	12	1	22	1	34	2
All ages	123	1	156	1	279	2

The possibility of milk having been a vector of the disease was eliminated when it was found that 238 or 85 per cent. of the cases used only the pasteurized product. That the disease was spread by direct contact was proved in a few families in which it was not recognized in the first case and spread to other members of the household with great rapidity.

The school nurses found numerous pupils in attendance who had mild sore throat and faint rashes, apparently not of sufficient severity to be considered by parents as reason for keeping them at home but merely as slight colds. Naturally, in these circumstances, the outbreak spread rapidly among the school population and was transferred by them to others. It will be noted in table I that practically 60 per cent. of the cases occurred in the school age-groups 5-14.

ACTIVE IMMUNIZATION

In an effort to check the epidemic, a campaign to actively immunize school children was carried on during February, 1938. With the consent of the Board

of Education and the Catholic School Board and the co-operation of the School Medical Officer and nurses, a clinic was held to administer scarlet fever toxin.

It was determined to Dick-test the children in order that statistics might be obtained as to the number of susceptibles and immunes, and to avoid the giving of five doses of scarlet fever toxin to those already Dick-negative. A bulletin was sent home with each child explaining the purpose of the test and requesting the parent to give his written permission for its performance. Following the reading of the reactions a further bulletin was sent informing the parent of the result and in positive cases requesting permission to administer five doses of scarlet fever toxin followed by a Dick-test. No tests were applied and no doses of toxin were given unless the written consent of the parents was first received. Following the final Dick-test a certificate was issued to each child receiving three or more doses of toxin. On these certificates which were obtained from the Ontario Department of Health were recorded the dates of the various doses given and the result of the final test.

A few children of pre-school age were Dick-tested when the work began. However, the percentage of negative results was so low that testing them was discontinued and the work confined to school pupils practically all of whom were in the age-groups 5-16 inclusive.

TABLE III
RESULTS OF PRELIMINARY DICK TESTS

Total number tested.....	2419
Number absent for reading.....	60
Net total.....	2359
Number positive.....	1677 or 71%
Number negative.....	682 or 29%

For the test, tuberculin syringes and 27-gauge needles were used. A small area on the flexor surface of the forearm was swabbed with tincture iodine and the needle inserted in the centre of this area. Cleansing with alcohol would be satisfactory but when tincture iodine is used there is no danger of inserting the needle through an unsterilized area. Tests were read 22-24 hours later and the results recorded on forms specially prepared for the work and supplied to each teacher. Directions supplied with the Dick-test solution by the Connaught Laboratories, University of Toronto, state that any degree of reddening, even the faintest pink, one centimeter or over in any diameter, indicates a positive test. Even with such explicit directions difficulty may be experienced in interpreting results, as it is found that many variations in shade and size of reactions occur. This difficulty is especially noticed in the final Dick-test when one's desire to achieve good results tends to influence the interpretation in favour of a negative test.

The response to the recommendation that Dick-positives receive five doses of scarlet fever toxin was good. Consent was given for 1,327 pupils but only 1,149 completed the series. Of the balance, 38 had four doses, 51 had three doses, 38 had two doses and 51 had one dose. There were many minor local

and general reactions but no severe reactions were reported. Sore arms, headache and nausea were the chief complaints and were considered by some parents as sufficient reason for refusing further doses. A straw vote conducted in one school indicated chiefly the second or third dose as causing the most inconvenience. As in other immunizing procedures, age is a factor in the occurrence of reactions, those of the teen age being more subject to them than their younger companions.

The final Dick-test was performed approximately four weeks after the last dose of toxin was given. The test was not confined to those who had received the entire series of five doses but was given to any who had three or more doses. A total of 1,238 received three or more doses, and of these 1,065 were Dick-tested. Nine hundred and sixty-nine (91 per cent.) were Dick-negative. The advantage of testing pupils who received three or more doses was demonstrated when it was found that of the 51 receiving three doses, 10 were tested and 8 (80 per cent.) were negative; and of the 38 receiving four doses, 15 were tested and 10 (67 per cent.) were negative.

It was originally intended to give additional doses to children showing a positive Dick-test following the first course of inoculations. However, when it was found that over 90 per cent. of susceptibles had been immunized, it was decided to postpone any further treatment until next year, when the clinic will be repeated.

During and following the campaign, 51 children in the public and separate schools developed scarlet fever. Of these, 1 had three doses, 1 had four doses, 3 had five doses, and 46 had received no doses of scarlet fever toxin. None of those inoculated had a final Dick-test.

The epidemic which began in the last week of November, 1937, reached its peak in January, 1938. The administration of toxin began in February and, as will be noted in table I, a decrease in the number of reported cases occurred at the same time. It was also noted that during March and April, reported cases were mostly adults. It is therefore felt that the inoculations were responsible for a reduction in the number of cases and that the campaign was justified.

DISCUSSION

In considering the desirability of Dick-testing all pupils before administering five doses of scarlet fever toxin, several factors deserve consideration. A negative Dick-test relieves the child of the necessity of further treatments which, to him, are just so many needle pricks. However, there are so few immune children that it is questionable if the preliminary Dick-test is necessary. As will be noted in table IV, there is a steady decline in the number of positive reactions as children become older. Before the age of 12 there is, apparently, little advantage to be gained by a preliminary Dick-test and it is suggested that, especially when large groups are being treated, the test be omitted and all children under twelve years be given the series of scarlet fever toxin. A reasonable amount of work may be eliminated if children of twelve years and over are first given a Dick-test.

TABLE IV

Age yrs.	No. tested	Dick test		Percentage	
		+	-	+	-
Pre-school	67	56	11	84	16
5	132	114	18	86	14
6	175	160	15	91	9
7	255	196	59	73	27
8	303	222	81	73	27
9	252	182	70	72	28
10	249	169	80	68	32
11	243	166	77	68	32
12	250	154	96	62	38
13	189	116	73	61	39
14	125	75	50	60	40
15	68	37	31	54	46
16	20	13	7	65	35
16+	31	17	14	55	45

One need have no fear of severe reactions following the inoculations. Mild local and general reactions may be noted but should not be of sufficient severity to prevent school attendance. Parental apprehension is the principal cause of discontinuing the series.

There is no doubt that the presence of scarlet fever in epidemic proportions in the community was the chief factor in influencing parents to permit their children to be immunized. It is felt that even under these circumstances the response was good and indicates a desire on the part of parents to co-operate with health authorities.

It is intended to hold an annual clinic in public and separate schools to immunize against scarlet fever. Children previously inoculated will be Dick-tested and if positive will receive further doses.

SUMMARY

A campaign to immunize school children against scarlet fever has recently been completed in Peterborough. A preliminary Dick-test showed that 71 per cent. of 2,359 children in the age-group 5-16 were susceptible. Susceptibility decreases as children grow older. Preliminary Dick-tests are unnecessary prior to 12 years of age. Inoculations of children with scarlet fever toxin are harmless and cause no severe reactions. Following the administration of scarlet fever toxin, 91 per cent. of 1,238 susceptibles were found to be immune. A reduction in the number of reported cases coincided with the beginning of the inoculations. Incidence in the age-group 15 and over showed a definite increase. Of 51 public and separate school children who developed scarlet fever following the campaign, 5 only had received varying quantities of scarlet fever toxin and none of these had a final Dick-test.

ACKNOWLEDGMENT

The writer is indebted to the Board of Education and the Catholic School Board for permission to carry on this work; to Dr. A. W. McPherson, School Medical Officer, who administered the scarlet fever toxin; to the school nurses for their assistance, and to the teachers who co-operated in the keeping of records.

The Contribution of Child Psychiatry to Mental Hygiene*

J. D. M. GRIFFIN, M.A., M.D., D.P.M.

National Committee for Mental Hygiene (Canada)

IN discussions of mental hygiene very little attention is paid to what is meant by the term "good mental health". Medical tradition is in the habit of defining physical disease in negative terms. Thus "good health" is "the absence of any demonstrable disease process". Following this custom mental health is frequently defined as the "lack of any psychopathology".

Psychiatrists have had a difficult time breaking away from such negative traditions. Dr. Douglas Thom has written: "Mental health is more than being free from delusions, hallucinations, intellectual deterioration, or other symptoms which we associate with actual mental disease—rather it is the nearest approach to a state of mind which may achieve maximum efficiency and greatest happiness, unhampered by habits and attitudes towards life that lead to varying degrees of failure." In other words, good mental health means *not* having bad habits!

A more meaningful interpretation of mental health might be developed by a consideration of the aims and goals of mental hygiene and ways in which child psychiatry can contribute to their achievement.

The chief goal of mental hygiene is, of course, the improvement of the mental health of the public. In the past this has been attempted in a variety of ways. Thus the National Committees for Mental Hygiene in both the United States and Canada have, for years, been fostering research calculated to throw more light on the care and treatment of psychotic patients. They have added their weight to provincial and state departments of health in their endeavour to provide stationary and travelling psychiatric clinics, training schools for the defectives and many similar projects.

When attention was turned to the problem of prevention there was greater difficulty. It was assumed in the first place that a great proportion of both major and minor types of mental illnesses had a psychogenic basis. It followed that insurance against such mental disabilities could be achieved through the development of robust mental health early in life. This has placed the emphasis on childhood.

Child psychiatry as a specialized field within psychiatry has attempted to answer the challenge of mental hygiene in many ways. Some have been more successful than others.

**Adapted from a paper given at a combined meeting of the Section of Preventive Medicine and Hygiene with the subsection of Neurology and Psychiatry of the Academy of Medicine, Toronto, held at the Toronto Psychiatric Hospital, March 24, 1938.*

Children's Psychiatric Clinics

Clinics for the handling of the psychiatric problems in childhood have been established in most large centres. It is difficult, however, to see how such clinics are doing very much in the way of "developing robust mental health" in children. By the time the child-patient comes to the clinic he is already suffering from some maladjustment. Therefore the best that can be done is to attempt to improve the "adjustment habits" of the child with a view to returning him to comparatively good mental health. This requires considerable time and more or less intensive work with each child-patient and his parents. A case was recently reported, for example, where a small girl of seven, who was suffering from enuresis, was given approximately two hundred and thirty-five hours of psychiatric treatment. And this case was supposed to be relatively uncomplicated and simple in its psychological structure (1).

It is sometimes stated that such maladjusted children are the future patients of our mental hospitals and, therefore, that successful treatment given early will prevent a future psychosis. There is but little scientific evidence available to support this idea, however. And in terms of building sound mental health in all the children of the country the work of such clinics must be negligible.

Parent Education

A more profitable direction for efforts in prevention on the part of child psychiatry would seem to be in the field of parent instruction. Attempts have been made to educate parents in the proper methods of raising their children. These methods are usually based on sound psychiatric and psychological principles. The difficulties are, again, obvious. All parents cannot be reached by educational channels or propaganda. Even if they could there is no guarantee that they would profit much by their instruction. And even if they did change their ways there is very little that could be done by such educational methods to improve environmental and social forces which, in addition to parents' attitude, may be detrimental to the wholesome development of children's personalities. Legislative reinforcement of such education, making it illegal, for example, to pamper and spoil a child, or to reject him by continual criticism and punishment, is hardly practical.

Co-operation with Paediatricians

Ever since the organization of paediatrics as a separate and distinct discipline, paediatricians have been interested in the good health of the so-called "whole child". More than many specialities, therefore, paediatrics has been doing a practical job in preventive medicine and mental hygiene. This is illustrated by the paediatricians' interest in the mental hygiene problems associated with physical disease, especially with prolonged convalescence (e.g., tuberculosis and poliomyelitis). The recent growth of psychiatric thought and practice in children's hospitals, as indicated by the organization of psychological clinics and the training of nurses in principles of the mental hygiene of children, is a further indication of this trend.

The paediatricians, however, are busy practitioners and, while they are ready to assume responsibility for the good mental health of their patients, it is too much to expect that they devote many hours of their time to problems as vague habits and attitudes as well as good social relationships are unexcelled.

Co-operation with Education

The elementary school and the high school are fields which provide real preventive possibilities. The child is in a relatively controlled environment for several hours each day and the possibilities of building in him sound emotional habits and attitudes as well as good social relationships are unexcelled.

Child psychiatry has tended to be critical of education in the past. It has taken delight in showing where the teacher has failed in his task. Research in the schools has drawn attention to the fact that needlessly oppressive discipline and lack of understanding on the part of the teacher have had dire results on the mental health of children. Such negative criticism, however, has had a few good results. The objective demonstration of a large group of children whose intelligence was so low that they could hardly benefit from education in the regular classrooms, and the consequent organization of auxiliary or special classes, is an example of the positive results of such negative criticism. In addition, teachers are becoming more and more aware of the emotional significance of behaviour problems, and are referring ever more frequently such children to psychiatric clinics for guidance.

The modern philosophy of education, however, has a true mental hygiene point of view. No longer can child psychiatry direct its criticism at the tenets and aims of education. Indeed, education, stimulated perhaps by psychiatry and mental hygiene, has gone ahead on its own initiative and developed a basic philosophy that is superior to much that child psychiatry has to offer. As an example, the following is quoted from the new program of studies in use in Ontario:

"Any education worthy of the name must be planned in accordance with the best available evidence on the nature of a child's development. Such evidence leads to the conviction that a child develops by virtue of his own activity. This activity comprises knowing and doing, which are to be regarded as synonymous terms, each of which implies purposeful effort. That the child's activity may result in development suited to his environment, it must be directed according to a plan. This plan, if it is to be accepted by the child as his own, must be determined by the nature of the child" (2).

Another paragraph is quoted from the program of studies recently issued in British Columbia:

"From the point of view of the individual the schools exist to aid him in his own growth or self-realization, in making adjustments to his environment, and, it may be, in modifying this environment, which is at once a social and a physical environment. These two processes, of adjustment and of growth, are largely complementary, but at times they involve conflict. From their reconciliation comes individual-social balance and the development of an integrated personality, socially efficient and capable of further growth and progressive adjustment. This capacity for progressive adjustment requires the development of critical thinking, of open-mindedness and freedom from prejudice, unimpeded by unregulated emotion. Character, therefore, may be said to be the main objective of education. The school and its curriculum should be organized to achieve this end" (3).

From such declarations of policy and confessions of faith, one can assume that the educationists regard the sound physical and mental health and wholesome personality of the child as being, not only important, but the very *raison d'être* of education. Naturally, it is too much to expect that, overnight, our schools change from institutions existing for the teaching of factual knowledge, to institutions interested in the development of mentally healthy children. But it is a trend, a shift in emphasis, that illustrates the effect of true co-operation between paediatrics, child psychology, and education. Thus, it would seem that, at last, a rational attempt is being made to achieve at least some of the goals of mental hygiene. The emphasis on the prevention of maladjustment in the schools, rather than the cure of maladjustment in clinics and hospitals, is a much more logical (and incidentally more strictly "preventive") approach to these goals.

Definitions in the psychiatric field are renowned for their wordiness. Nevertheless good mental health can now be defined meaningfully. The mentally healthy person is one whose personality is developed to its greatest possibilities so that he is able to give his best to the world and to know the deep satisfaction of a life richly lived.

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The Seventh Annual Christmas Meeting

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A Localized Outbreak of Poliomyelitis

ASBURY SOMERVILLE, B.A., M.D., D.P.H.

Medical Officer of Health

Foothills Health District, High River, Alberta

DURING the late summer and fall of 1937 Medicine Hat, Alberta, and the surrounding rural territory suffered an epidemic of poliomyelitis. During that time one of the teachers from the Foothills Health District at High River was visiting Medicine Hat, and on returning to her home developed symptoms of the disease. She opened the school while still acutely ill. The school had only eight pupils, all of whom were between six and ten years of age. There had been no cases of poliomyelitis in the school district during the lifetime of these pupils and the nearest cases during this outbreak in High River were in Calgary, about fifty miles away. None of these pupils had been away from home in the weeks immediately preceding.

The following case histories are self-explanatory and indicate the apparent spread in the school children.

Case No. 1

Teacher. She had been visiting in Medicine Hat for several weeks, but without any known exposure to poliomyelitis cases. She became ill on August 28th, complaining of chills, a very severe headache in both temples, and a sore throat which lasted about twenty-four hours. Her voice became definitely weakened. On the following day these symptoms subsided but marked dizziness was present. She was much better on August 30th and travelled by bus to High River. At this time her voice was normal. On August 31st she was ill again; this, perhaps, was the real onset of the disease. She had a severe headache and vomited at frequent intervals during the afternoon and evening. On September 1st she opened the school but was very dizzy and tired and dismissed her pupils early. She did not remember the occurrence of any stiffness or soreness of the neck. On September 2nd she noticed that the side of her head was sore, combing her hair causing pain. The area of soreness slowly extended down her body. On September 7th she reopened school and continued teaching for the following four days. She stated that she felt so tired that she sat at her desk and had the pupils bring their work to her. On September 4th she noted difficulty in swallowing, so that it was necessary to make five or six attempts in order to swallow a spoonful of water. This difficulty gradually lessened, disappearing entirely in three months. She did not consult a doctor. No weakness or paralysis of the extremities or other parts of the body developed.

A small group of children of very susceptible age were thus exposed to this possible source of infection for a few hours on September 1st and again for four days, September 7th to 10th.

Case No. 2

A boy aged 7 years, nephew of case no. 1, was exposed at school for the five days mentioned and also at home from the time the teacher returned on August 30th. On September 11th, he complained of headache and dizziness. He did not desire food, vomited, and was fevered. On the following day he had a moderate degree of stiffness of the neck and spine. His pulse rate was fast in proportion to the moderate degree of fever. Spinal fluid was not withdrawn. He was given 20 cc. of human convalescent serum. A few days later he had slight difficulty in speech and could not whistle. Two weeks later, when allowed up, he had pain in his legs for a few days and said that he could not run. He made a complete recovery.

The school was closed on September 11th and the exposed children quarantined.

Case No. 3

Boy, aged 8 years. He was exposed on the five days mentioned and also to case no. 2 at school on September 10th, the day before the onset of symptoms in case no. 2. This child vomited while riding in a car on September 23rd, but "car-sickness" was not unusual. On the 24th, i.e., fourteen days after the last known exposure, he lay around all day and on the morning of the 25th had definite symptoms. He appeared flushed and frightened. His temperature was 101° F. and the pulse rate was 130. He complained of severe headache and vomited several times. He objected to being handled. His head was slightly retracted and the neck and spine were immobile. He complained also of aches and pains in his arms and legs. He was immediately given 20 cc. of poliomyelitis serum and 20 cc. was divided equally among the three younger children in the family. No spinal fluid was withdrawn. The child made a complete recovery.

This case is of special interest because of the fourteen-days' incubation period and because he was apparently still infectious after twenty-one days, as shown by the development of cases 4 and 5, with whom he played for an hour or two on October 15th, practically three weeks after the onset. The weather during October was like mid-summer.

Case No. 4

Girl, aged 6 years. She was exposed to case no. 3 on October 15th. The onset of symptoms was on October 27th, twelve days after a brief exposure. On October 29th she developed definite symptoms which were not nearly so severe as those case no. 3 experienced. She did not show any fear and did not object to being handled. She could place her chin on her chest but she had definite stiffness of the dorsal and lumbar areas of the spine. Her temperature was 100.1° F. She had vomiting and complained of headache. The pulse rate was 150. No lumbar puncture was made. She was given 20 cc. of poliomyelitis serum and two sisters were each given 10 cc. Twelve hours later her left arm was almost completely paralysed, slight movement being possible in the flexor muscles of her fingers. When examined in September, 1938, she was found to have well-marked residual paralysis.

Case No. 5

Girl, aged 7 years. This case was not reported as a case. Her history is included on account of the interesting symptoms and the fact that she was the only other case of illness in the school district during the period of the epidemic. The child was exposed to case no. 3 on October 15th. On October 23rd, eight days later, she vomited and complained of headache in the occipital region and for the following week was drowsy and tired. She was seen by a physician on October 27th, 28th, and 29th. On these days there was not any apparent evidence of disease except that the patient appeared very tired and objected to exercise. The temperature was normal on those three days and the parents thought that it had not been above normal previously. The symptoms of tiredness remained for about three weeks, then cleared completely. When seen on the three days mentioned, the neck and lower spine showed normal flexibility. No spinal fluid was withdrawn.

None of these patients had any coryza and there was no complaint of diarrhoea or constipation. After the first two cases, each appeared in a separate household. When taken in their location in the series, I think these cases all warrant a diagnosis of poliomyelitis, probably even no. 5, although if they had been seen isolated from the group, such a diagnosis might not have been made. It is regretted that circumstances did not permit of the study of spinal fluids.

SUMMARY

The histories of five cases of poliomyelitis occurring in a rural area are given. The first case was a school teacher, showing, with other signs and symptoms, fairly definite loss of voice, with complete recovery. The four other cases were in children attending the school; two of them showed definite paralysis, with complete recovery in one and partial recovery in the other.

The spread appears to have been from the teacher to and among the pupils. The incubation periods, in cases in whom exposure could be fairly defined and limited, varied from eight to fourteen days. One child who did not show any paralysis but was definitely sick appears to have been the source of infection for two other cases twenty-one days after the onset of his symptoms. The exposure of these two cases was apparently limited to one or two hours' play with the recovered child. In one of these two cases the incubation period was twelve days, with paralysis occurring in spite of serum being given twelve hours previously. In the other case the incubation period was eight days. This latter case did not show paralysis and was not notified as poliomyelitis.

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THE PROBLEM OF BRUCELLOSIS

THE publication in this issue of a study of brucellosis in Edmonton, Alberta, again focuses attention on this problem. When the disease was first recognized in Canada ten years ago, it was felt that in view of the widespread infection of dairy herds with contagious abortion and the wide use of raw milk, many cases would be reported. On the contrary, less than two hundred cases were reported last year. Several of the provinces did not report any cases. In the United States an increasing number of cases is being reported, indicating the growing attention to this problem. The number has increased from 112 in 1927 to 2,497 last year. Knowledge of the incidence of the disease in Canada, as in the United States, is being obtained largely through the diagnostic public health laboratories.

In Canada valuable information was obtained recently by Dr. C. E. Dolman in a study of brucellosis in and around Vancouver, where almost one-quarter of the milk supply is raw milk. Serological testing of whey and the isolation of *Brucella abortus* from a number of samples of raw milk indicated a high incidence of infection among the cattle. As a result of this investigation, fifteen cases of brucellosis were diagnosed and clinically confirmed. From the blood of nine of these patients *Brucella abortus* was isolated. In the Edmonton study, ten cases were reported during 1937 and January, 1938. These two studies are sufficient to indicate that a considerable number of cases of brucellosis occur and that frequently they are not diagnosed.

There is evidence that *Brucella* infection may be chronic and that it may be responsible for much ill-health in which a diagnosis of neurasthenia is often made or the illness attributed to some undiscoverable focus of infection. There is an urgent need in Canada for the investigation of chronic brucellosis as well as of the disease in its acute form. There are many gaps in our knowledge of the epidemiology of the disease but the essential facts are established; namely, that a very considerable amount of illness, largely undiagnosed, is due to infection with *Brucella abortus* and that the bulk of this illness is due to the consumption of raw milk. Pasteurization is the only effective means for eliminating this unnecessary volume of sickness.

REPORT OF THE ASSOCIATION'S WORK DURING 1937

Part V

SECOND ANNUAL REPORT OF THE SUBCOMMITTEE ON STILLBIRTH REGISTRATION AND CERTIFICATION

(Committee on the Certification of Causes of Death)

DATA on the frequency and the causes of stillbirth are essential if a scientific effort is to be made to reduce the incidence of stillbirths. The first step toward achieving this objective was the statutory requirement that "stillbirths" shall be registered. Present practice, except in Quebec where a single form has been used since 1932, requires registration of stillbirths as births and as deaths.

A second step toward improving the value of stillbirth statistics was the adoption for national statistical purposes of a uniform definition of a stillbirth, namely that proposed by a Committee of the Health Section of the League of Nations in 1925, *viz.*:

"A stillbirth is the birth of a foetus after 28 weeks or 6½ months of pregnancy, measuring not less than 35 cms. from the crown of the head to the sole of the heel, in which pulmonary respiration does not occur after complete birth. Such a foetus may die either (a) before, (b) during, or (c) after birth or complete extrusion of the head, trunk and limbs from the body of the mother, but before it has breathed."

The adoption of this definition in 1931 and its general application in 1932 has served to make uniform the tabulation of deaths among viable foetuses and to make interprovincial comparisons of data more useful.

The third step to be taken is the institution of a single stillbirth form and the securing of accurate data on the causes of stillbirth which are not as yet available in Canada. With these matters this Committee is chiefly concerned. This year special attention was given to drafting in final form a certificate for the registration of stillbirths which could be recommended as an acceptable minimum standard for national use.

The Need for a Single Stillbirth Form

A growing interest in foetal mortality is in itself not the sole reason for a special stillbirth certificate. Other reasons are:

(a) Although stillbirths are now registered both as births and as deaths, this double registration does not suffice to ensure the recording of data on the causes of stillbirth, where known.

(b) The standard death certificate contains many questions which are not pertinent to stillbirths, while other points upon which information is of value are not included.

(c) Reliable information concerning the period of gestation is required if "stillbirths" are to be properly classified. Only the birth certificate now contains this data (except in Quebec), the medical certificate of death completed by the physician making no reference to it.

(d) If the information desired (period of gestation, cause of stillbirth, etc.) is to be secured, some change in stillbirth registration practice is needed.

The Introduction of a Single Form in Quebec in 1932

Subsequent to the adoption of the definition of stillbirth proposed by a Committee under the chairmanship of Dr. Gagnon in 1931 and the early stimulation of the interest of this Section in stillbirths, by Drs. Gagnon and Parrot, a special stillbirth certificate (Form C) was introduced for use in Quebec. This certificate includes special data on period of gestation, signs of life observed, etc., and furnishes all the statistical information obtained by the double registration scheme in other provinces. Great success has attended the use of this form.

In 1936 the Dominion Bureau of Statistics invited an expression of opinion from the provinces concerning the practicability of introducing throughout Canada a single stillbirth certificate to replace the present double registration system. In June of the following year it was indicated that general agreement had been reached as to the desirability of a single stillbirth registration form and the early initiation of a single registration scheme.

Action by the Section of Vital Statistics

In the following year, preliminary consideration was given to some of the problems of stillbirth registration and certification by the Committee on Certification of Causes of Death and the idea of a single form for the registration of stillbirths in Canada was endorsed. Questions considered to deserve inclusion on such a form were: (a) period of gestation at birth; (b) type of labour and delivery; (c) time of death in relation to labour; (d) condition of foetus at birth; (e) occurrence of spontaneous respiration; and (f) autopsy and findings.

This Subcommittee was appointed to study the problem in detail and to present recommendations regarding the nature of a stillbirth form for national use. In 1937 a survey of existing stillbirth forms was made and the following fundamental principles laid down in the first report.

(a) A special stillbirth certificate should contain all pertinent data now included on the birth and death certificates.

(b) Particular concern should be attached to the medical section of the certificate and questions considered for inclusion in the medical section should be practical and be limited to the necessary minimum.

(c) The questions relating to cause of death on a national stillbirth certificate should be similar to if not identical with those on the standard death certificate.

These principles were approved by the Section in June 1937. The draft of a proposed stillbirth certificate based on these principles and presented at that time was also approved for experimental trial.

A brief, setting forth these various steps in connection with the introduction of a special form for the registration and certification of stillbirths, was prepared for the Committee and submitted to the Registrar General of each province and other interested persons on May 23rd last.

SECTION I. THE FORM OF A NATIONAL STILLBIRTH CERTIFICATE

In drafting a stillbirth certificate the Committee was guided by the work in the province of Quebec, by the principles named above, by experience and practice elsewhere in the world, and by suggestions made throughout Canada. Not all suggested questions were added to the medical section because of the desire to limit them strictly to the minimum. The Subcommittee wishes to reaffirm at this time its opinion that a certificate of registration of stillbirth, while it will yield much valuable information bearing upon the causative factors in stillbirth, should not be expected to be as comprehensive as a special inquiry form might be. The certificate should be designed primarily to serve well its chief purpose, namely registration and certification, and contain essentially only questions to this end.

The Trial of the Medical Section of the Proposed Form

This year the experimental trial endorsed by the Section last year was carried out with the idea of correcting any defects before recommending a final form for national use, as well as to determine the attitude of physicians and hospital authorities to such a certificate as that suggested. Those provinces especially anxious to introduce a stillbirth form at an early date, agreed to await the Committee's final recommendations.

The trial was limited to the medical section of the form, since the civil data were fixed more or less by routine practice and since one of the chief objects was to learn how well the questions relating to cause of death would suffice to elicit a clear statement.

The experimental certificate was prepared in printed form including instructions and explanatory notes. Illustrations of the use of the medical certificate of cause of stillbirth were presented on the back. The co-operation of the Registrar General's Department in New Brunswick, Quebec, Ontario, Manitoba, and Alberta, was secured and arrangements effected for obtaining returns from hospitals as well as from practitioners attending stillbirths in the home. In Ontario arrangements were made by the Committee directly with the superintendents and chiefs of staff in twenty public hospitals. The period of trial extended over five months from December 1937 to May 1938.

Analysis of the Returns

A brief review of the forms returned to the Committee will be presented with discussion and recommendations based on the findings and other sources of information on hand. There were 443 forms returned to the Committee, representing 67 hospitals and 313 physicians (table I).

TABLE I
EXPERIMENTAL STILLBIRTH CERTIFICATES RETURNED

Province	Number of returns	Hospitals represented	Physicians represented
New Brunswick.....	19	3	11
Quebec.....	137	11	97
Ontario.....	171	17	114
Manitoba.....	71	24	56
Alberta.....	45	12	35
Total.....	443	67	313

The sample of certificates, although small, is fairly representative. The Committee wishes to record at this time its appreciation of the excellent co-operation given by provincial Registrar Generals' departments, staffs of hospitals, and practising physicians, in making this study possible.

The Questions Relating to Cause of Stillbirth

Of special interest is a review of the recorded statements of cause of stillbirth. It has been pointed out previously that in view of the careful experimental work which preceded the decision to recommend revision of the questions relating to cause of death in 1934 (which revision brought the Canadian medical statement into line with the English one and with the recommendations of a special committee of the League of Nations in 1925) and in view of the growing success of the new method in eliciting statements which indicate medical opinion clearly, the Committee in its first report recommended that the "questions relating to cause of death on a national stillbirth certificate should be similar to if not identical with those on the present standard death certificate."

There appeared to be general agreement that such a decision was sound on *a priori* grounds. This decision is supported by the obvious desirability of avoiding two different types of medical statement on official forms and by the fact that classification of stillbirths to a single clinico-pathological rubric is definitely facilitated by this method and at the same time other complicating or independent (important) conditions can be tabulated if such is desired. The questions relating to cause of stillbirth were designed with these points in mind.

The certificates of cause of stillbirth were reviewed in order to assess the success of the medical questions in securing information as to the underlying clinical or pathological condition responsible for foetal death. Where information was available on the form giving sufficient indication of this to permit proper classification, the statement was classed as "satisfactory," regardless of whether the entries were properly made or not. (The errors in the use of this form were similar to those now made by physicians on the death certificate.) Certificates containing statements of terminal events only or in which no clear indication of the picture was afforded, were classed as "unsatisfactory." The "unknown" group contains those in which the physician stated "cause unknown."

Table II gives the findings on this basis for stillbirths occurring at home as well as in hospital.

TABLE II
CLASSIFICATION OF MEDICAL STATEMENTS OF CAUSE OF DEATH
EXPERIMENTAL STILLBIRTH CERTIFICATE RETURNS
1938

Province	Class of Medical Statement						Total
	Hospital			Home			
	Satisfactory	Unknown	Unsatisfactory*	Satisfactory	Unknown	Unsatisfactory*	
New Brunswick..	15	0	2	2	0	0	19
Quebec.....	37	1	7	70	7	15	137
Ontario.....	100	4	8	48	4	7	171
Manitoba.....	40	2	8	16	2	3	71
Alberta.....	37	0	8	0	0	0	45
Total.....	229	7	33	136	13	25	443

*Statements as asphyxia, prematurity, etc.

Of 443 returns only 58 or 13 per cent. were "unsatisfactory" and most of these were cases in which the physician had no opportunity to learn sufficient of the cases to make a statement or in which a record had not been made. The cases classed to "unknown cause" were few, though in field practice this group is likely to be fairly large. The Committee feels that physicians "should be encouraged to state *cause unknown* rather than make a statement not justified by available history or evidence." It is especially significant that there were no certificates in which the word "stillbirth" alone was used in the medical statement of cause of death. This is encouraging since a large proportion of the death certificates now completed for stillbirths contain this word and nothing else (*vide infra*).

In 365 of the returns or 82 per cent., the medical statement of cause of stillbirth was "satisfactory." In about one-third of these the order of statement was incorrect but the clinical data were recorded, and that is the significant point. This finding is even more striking because the proportion of satisfactory returns from physicians in rural areas or in cities and towns for stillbirths occurring at home was almost as high (78 per cent.) as that in the hospital group (85 per cent.) (table II).

These findings clearly establish the questions relating to cause of death on the standard death certificate as satisfactory in eliciting a logical statement of cause of stillbirth. The Committee feel, therefore, that the major object of this inquiry has effectively supported the opinion expressed in its first report to this effect.

The Influence of the New Form of Medical Statement on Present Returns of Cause of Stillbirth

As a further test of the effectiveness of the questions relating to cause of

death on the standard death certificate in eliciting an acceptable statement of cause of stillbirth, a review of a sample of stillbirth certificates for the province of Ontario was made. The Dominion Bureau of Statistics co-operated in supplying to the chairman of this Committee 1,040 certificates of stillbirths which were of such nature as could be reasonably regarded as a random sample. These certificates were reviewed in order to determine the difference, if any, between the statements on the old type of certificate and those on the new.

In the Ontario Vital Statistics Act, it is specified that the death certificate of the stillborn child shall contain the word "stillborn." This, in fact, was what constituted the statement of cause of death on the medical certificate of a large proportion of stillborn children. Table III indicates the findings in respect to the statements of cause of death on the stillbirth forms.

TABLE III
ANALYSIS OF A SAMPLE OF STILLBIRTH CERTIFICATES
Ontario, 1937

Type of Statement	New Death Certificate		Old Death Certificate		Total
	Number	Per cent.	Number	Per cent.	
"Stillbirth".....	316	36.8	86	47.2	402
Malformations*.....	92	10.7	19	10.4	111
Satisfactory entry†.....	342	39.9	50	27.5	392
Others‡.....	79	9.2	27	14.8	106
Unknown.....	29	3.4	0	29
Total.....	858	100.0	182	100.0	1,040

*Monsters, hydrocephalus, etc.

†Intracranial haemorrhage due to contracted pelvis, foetal asphyxia due to maternal toxæmia, etc.

‡Prematurity, asphyxia, etc.

Of 858 new certificates, the statement given by the physician was a logical scientific statement of cause of stillbirth in over 50 per cent. of cases. In 3.4 per cent. the doctor stated the cause was unknown. In the relatively small sample of old forms (182) a distinctly smaller proportion of the statements were of a satisfactory nature, and a much larger proportion were ones in which the physician entered the word "stillborn" only.

This review demonstrates that even under the present registration system, statements of cause of stillbirth have been definitely improved since the revision of the questions relating to cause of death in 1935.

The Supplementary Medical Questions

A complete résumé of the remainder of the data on the experimental forms has not yet been completed, but the replies to the ancillary medical questions were reviewed sufficiently to report at this time that replies to every question were given in 90 to 95 per cent. of cases, indicating that there was no evident

objection to any of the questions included. However, these returns were confidential ones between physician and Registrar General's department, and this Committee is strongly of the opinion that, since the first objective of a stillbirth form is to secure registration and a statement of cause of death primarily and NOT to serve as a basis for an exhaustive investigation into the problem of stillbirth, supplementary questions should be limited to those pertinent and essential. With these points in mind a review was made of three, namely period of gestation at birth, time of death in relation to labour, and type of delivery.

Table IV gives the distribution of the returns by period of gestation and time of death in relation to labour.

TABLE IV
STILLBIRTH RETURNS BY AGE OF FOETUS AND TIME OF DEATH

Age of Foetus in Weeks	Time of Death								Total	
	Before labour		During labour		After labour*		Not stated			
	No.	%	No.	%	No.	%	No.	%	No.	%
28-31.....	50	23	12	8	4	8	6	20	72	16.2
32-35.....	38	18	17	12	8	16	5	17	68	15.4
36-37.....	38	18	21	14	4	8	3	10	66	14.9
38 to term.....	70	32	79	54	33	65	6	20	188	42.5
40+.....	8	4	14	10	2	4	0	...	24	5.4
Not stated.....	12	6	3	2	0	...	10	33	25	5.6
Total.....	216	100	146	100	51	100	30	100	443	100.0

*But before respiration.

Of the cases, 46.5 per cent. were under 38 weeks' gestation. Almost 70 per cent. of stillbirths of less than 32 weeks' gestation occurred before labour, while in the group 38 weeks or over just slightly more than one-third occurred before labour.

The data on type of delivery by time of death in relation to labour are shown in table V.

TABLE V
STILLBIRTH RETURNS BY TYPE OF DELIVERY AND TIME OF DEATH

Type of Delivery	Time of Death								Total	
	Before labour		During labour		After labour*		Not stated			
	No.	%	No.	%	No.	%	No.	%	No.	%
Spontaneous.....	174	81	60	41	28	57	16	53	278	62.7
Instrumental.....	27	12	58	40	15	29	3	10	103	23.3
Version.....	10	5	19	13	7	14	4	13	40	9.0
Operative.....	4	2	9	6	1	2	0	...	14	3.2
Not stated.....	1	...	0	...	0	...	7	23	8	1.8
Total.....	216	100	146	100	51	100	30	100	443	100.0

*But before respiration.

Delivery was spontaneous in 62.7 per cent. of the cases. In 35.5 per cent. "operative procedures" were undertaken for delivery and of these cases in 54.8 per cent. death occurred during or after delivery. Of the deaths during labour in 59 per cent. operative procedures were undertaken for delivery.

Comments on the Experimental Medical Certificate of Stillbirth

During and at the close of the period of trial comments were invited upon the questions contained in the form and the practicability of the experimental certificate for inclusion in a national stillbirth certificate, from the viewpoint of the physician.

No unfavourable comments were received. On the contrary in 12 instances in which written comments at the close of the survey were made by the superintendent or senior staff members of large hospitals and in 10 cases by physicians completing forms for stillbirths occurring at home, the statements were strongly in favour of this medical section replacing the present one and of single registration of stillbirths replacing the present system. Indeed, additional questions were suggested for inclusion.

This attitude has significance in three respects. First, physicians apparently find the questions relating to cause of stillbirth essentially satisfactory. Second, they endorse the idea of single registration of stillbirths by the use of a special form. Third, no objection is likely to be made to medical questions included. It must not be concluded that returns of stillbirth on a special form will be as complete as in this experiment. A special type of approach was made to the profession concerned and the material was confidential. Neither can it be deduced that it would necessarily be practicable to introduce a form as extensive as the Committee's draft for field use.

The Nature of Ancillary Medical Questions on a National Certificate of Stillbirth

The extent to which use can be made of information collected on field certificates largely determines whether or not a given question should be included. The introduction of a national stillbirth form should not be an occasion for inclusion of material not specifically pertinent to registration and certification. Nothing can be lost by being conservative in the beginning though something might definitely be lost by including too great detail on an open certificate. Detailed studies of stillbirth, as deaths of other sorts, have to be made in other fashions.

The Committee therefore recommends that only those questions which are absolutely indispensable or for the inclusion of which there is a substantial argument now, be considered. Future needs and experience may suggest the advisability of additions, but it is unwise to have one certificate of registration distinctly out of line in respect to detail with other forms.

The following medical questions are suggested as the minimum desirable for inclusion in a national stillbirth form:

- (1) State period of gestation at birth in completed weeks (weeks)
- (2) Was there manipulative, instrumental or other operative procedure for delivery? Was foetus dead before such procedure?
- (3) State nature of such procedure
Low, middle or high forceps, version and extraction, breech extraction, Caesarean section, craniotomy, etc.
- (4) Did death occur before labour? Yes No during labour? Yes No after labour (but before respiration)? Yes No
- (5) Was there an autopsy? State findings

This recommendation excludes the following questions which were included in the original draft: "Was labour induced? Specify how", "Total duration of labour (hours)", "Was foetus macerated?", "Specify any signs of life observed after birth", and "Was there a birth injury? State nature". It is not implied that these facts are not of importance, but rather that they are not essential to the immediate objective.

Final Draft of a Stillbirth Certificate for National Use

In the light of the results of the experimental trial and in view of known needs and practical limitations, the Committee has prepared a final draft of a proposed stillbirth certificate. The face of this form is shown in Figure I. The Committee regards this form as an acceptable minimum standard for national use and urges its adoption as such. The Committee further urges that careful provision should be made to present on such a stillbirth form sufficient explanatory notes to assist both registrars and physicians in the collection of the data. The definition of a stillbirth, notes on the physician's statement of cause of stillbirth and illustrations of its use are things which should be included.

This Section has already gone on record in favour of a single form for the registration of stillbirths and believing that this step will be taken at an early date, it should be pointed out that it will be necessary for provincial Vital Statistics Acts to be amended. It is desirable therefore that this Section go on record urging appropriate legislative revision, at which time the national definition of a stillbirth for statistical purposes might be inserted. The Committee is of the opinion that such legislation should not be such as to make unnecessary the registration of foetuses under 6½ months. While live births are uncommon at an earlier time, they do occur and registration should not be specified as unnecessary in these cases.

The Committee further urges that efforts be made to direct the attention of practising physicians and medical students to proper practice in the use of the new stillbirth form, when introduced.

SECTION II. STILLBIRTH NOSOLOGY

In the Committee's first report a review was presented of existing schemes for the classification of the causes of stillbirth. The varied nature of these schemes indicated distinct lack of agreement as yet as to what constitutes an acceptable list. The Committee will continue its researches on this question and will present further material next year on this subject.

PROPOSED CERTIFICATE OF REGISTRATION OF STILLBORN

Note: (1) A stillbirth is defined as a "child" born after 28 weeks or of months pregnancy, in which breathing does not occur after complete birth. (See instructions on reverse side.)
 (2) In case of more than one stillborn child at a birth, a separate return must be made for each and the number of each in order of birth indicated.

1. PLACE (a) County or District..... Township..... Municipality..... (City, town or village)		2. Length of stay of mother (years, months, days) in municipality where birth occurred..... in province..... in Canada (if immigrant).....	
3. Usual residence of parents (or mother) No. Street..... City, town, village or township..... Province.....		4. Name of child (if named)..... 5. Was there a physician in attendance?..... M.D.?..... (Given name, if any) (Surname)	
6. Sex..... 7. Single, twin, triplet, or other..... 8. Are the parents married?..... 9. Date of birth..... Month..... Day..... Year.....		MEDICAL CERTIFICATE	
10. Full name..... 11. Nationality..... 12. Racial origin..... 13. Birthplace..... 14. Age last birthday..... Years..... (Province or Country)		31. I..... Cause of Stillbirth..... Immediate cause..... (a)..... The disease, injury or complication which caused fetal death..... due to..... (b)..... Morbid conditions, if any, giving rise to immediate cause (stated in order proceeding backwards from immediate cause)..... due to..... (c).....	
OCCUPATION 15. Trade, profession or kind of work as stevedore, teamster, office clerk, etc..... 16. Kind of industry or business, as cotton-mill, lumbering, bank, etc.....		II Other morbid conditions (if important) contributing to fetal death..... Immediate cause.....	
17. Full maiden name..... 18. Nationality..... 19. Racial origin..... 20. Birthplace..... 21. Age last birthday..... Years..... (Province or Country)		32. State period of gestation at birth in completed weeks..... (weeks)	
22. Total number of births to this mother (including the present birth)..... (a) Born alive..... (b) Now living..... Was foetus dead before such procedure?..... (c) Stillborn..... (d) Birth before 28 weeks gestation.....		33. Nature of procedure..... Low, middle or high forceps, version & extraction, Caesarean section, craniotomy, etc..... 34. Did death occur before labour? Yes..... No..... 35. Was there an autopsy?..... State findings..... 36. I hereby certify that I attended the birth of the above stillborn child and that the above statements are correct to the best of my knowledge and belief.	
23. Place of marriage of parents..... 24. Date of marriage of parents..... 25. Person giving information sign here..... 26. Address..... 27. Relationship to child.....		Signed by..... M.D. Address..... Date.....	
28. Place of burial, cremation or removal..... 29. Date of burial or removal..... 30. Undertaker..... (Name and address)		37. Division Registrar's record number..... 38. Date of registration..... 19..... (Division Registrar)	

FIGURE 1

The Committee withdraws its previous recommendation that a list of causes be agreed upon *before* a national stillbirth certificate is introduced, but suggests that the Dominion Bureau of Statistics be asked to make an analysis of the returns on the medical certificate of cause of stillbirth for the first 6 months or year that the new form is in use. It is desirable too that no definite decision regarding the classification of causes of stillbirth be made until the report of the Commission revising the International List in October this year becomes available.

Quebec has already begun the tabulating of stillbirths by cause according to a convenient short list. This is a worth while start in this field, pending further work and experience and some definite recommendations on a national scale.

SECTION III. STATISTICAL PRACTICE IN RESPECT TO CHILDREN BORN ALIVE UNDER 28 WEEKS' GESTATION

Present practice in Canada in respect to the statistical treatment of children stated to have been born alive, in which the period of gestation is specified as less than 28 weeks or $6\frac{1}{2}$ months, and in which the infant lives less than 24 hours, is to exclude them from both birth and death statistics. This practice is an extension of the former practice when 6 months was the minimum period of gestation for a stillbirth.

In the United States the practice is different. According to Rule of Statistical Practice No. 19, adopted by the Section of Vital Statistics of the American Public Health Association in 1908, "no child that shows any evidence of life after birth should be registered as a stillbirth." Dr. Halbert L. Dunn, Chief Statistician for Vital Statistics of the Bureau of the Census at Washington, indicates that on the basis of definitions adhered to in the Bureau, all death certificates of "live-born" children are accepted as such regardless of the stated period of gestation. In the report presented by the Subcommittee on Stillbirths of the Committee on Accuracy of Certified Causes of Death to the American Public Health Association in 1935, it is stated that

"While it is rare for a product of pregnancy of less than 28 weeks' gestation to present evidence of life after complete birth (*i.e.*, action of heart, breathing, movement of voluntary muscle) such instances seem to be of undoubted authenticity, and when this does occur it is worthy of special medical record and supporting comment. Under rule 19, 1908, as amended in 1913, such products are, of course, registered as live births."

It would appear that this difference in practice between the United States and Canada may be responsible for a significant difference in infant death rates. Indeed, information available shows that the elimination from the infant death tabulations of deaths among live born infants in which the period of gestation was less than $6\frac{1}{2}$ months, may produce an infant death rate 5 per cent. lower than when *all* deaths among live born infants are included. The influence of this practice upon the birth rate is of course insignificant.

It should be borne in mind that our criterion of life in the newborn is that used by the Committee of the League of Nations which prepared the definition

of stillbirth adopted by the Section of Vital Statistics in 1931, namely *respiration* after complete birth. In contrast, in England and Wales and the United States, "no child that shows *any evidence of life after birth*" is classed as a stillbirth.

This Committee is of the opinion that this whole question deserves careful thought. For the sake of comparability and since there is a fairly wide margin of error in estimating the period of gestation, consideration should be given to the suggestion that *any child which manifests the accepted criterion of life, namely respiration after complete birth, should be registered as a live birth, and all deaths of live born children should be included in both live birth and infant death statistics, regardless of the period of gestation.*

With the introduction of a single form for the registration of stillbirths and with the changes in the Vital Statistics Acts which must undoubtedly precede or accompany this change in administrative practice, it is further important that a decision be reached on two points: (a) Are infants who are live born in a clinical sense to be eliminated from both birth and death statistics merely because the period of gestation is stated to be less than 28 weeks or 6½ months? (b) Should registration of births be specified in the various Vital Statistics Acts as necessary only for products of conception of 28 weeks or over?

For example, the Saskatchewan Vital Statistics Act states "No record of a birth or a death shall be required in the case of a child which has not advanced to the 28th week of uterogestation." This section is in keeping with present practice of excluding all births and deaths in which the foetus was stated as of less than 28 weeks' gestation and in which the infant lived less than 24 hours. It does appear that a preferable wording for such a section would be:

"A record of a birth or death shall be required in the case of any child which breathes after complete birth regardless of the period of uterogestation. Of the infants in whom pulmonary respiration does not occur after complete birth, registration shall be required only in those in which the period of uterogestation is 28 weeks or more."

There is no harm in including the accepted national statistical definition of a stillbirth in Vital Statistics Acts if it clearly does not render unnecessary the registration of live births under 28 weeks' gestation. For practical and legal considerations it would appear to be unwise to exclude these latter cases.

The Dominion Bureau of Statistics is now approaching the provinces in this connection, and the Committee feels that the clarification of this matter in the manner suggested is in the best interests of vital statistics.

SECTION IV. THE NEED FOR STANDARDIZATION OF VITAL STATISTICS LEGISLATION IN CANADA

At the present time there is no uniformity among the provinces in the statutory period beyond which stillbirths have to be registered, nor do all acts specify a minimum period of gestation for this purpose. The Vital Statistics Act in five of the provinces does not include any reference to the approved definition of a stillbirth for statistical purposes. This deficiency is not a serious one, since it is nationally agreed that the approved definition will be applied in

all tabulations. It would seem, however, that a clarification is definitely needed. In Ontario, for instance, there is no specification as to the period of gestation under which the products of conception do not need to be registered. However, in view of the fact that foetuses may be born alive and yet not have reached 28 weeks' gestation, it would seem to be unwise to suggest that such changes in registration include provision that the products of conception of less than 28 weeks' gestation need not be registered. In fact, for obvious reasons it would be undesirable to do so, although this wording is included in the Saskatchewan Act.

The definition of a live birth is not made clear in the Vital Statistics Acts. Presumably in a legal sense the definition is that which obtains in England and Wales and the United States, namely "a foetus which shows any signs of life after complete birth." This is a further point which needs to be clarified as pointed out in Section III above, and one which will have considerably greater significance when single registration of stillbirths is initiated.

It is definitely desirable that uniformity in essential features of Vital Statistics Acts be achieved in so far as they bear upon these various points. The opportunity for securing such uniformity will present itself when revision necessitated by the contemplated change in stillbirth registration practice is undertaken.

H. A. ANSLEY, EUGENE GAGNON, A. P. PAGET, DONALD MACKIE,
PAUL PARROT, E. J. PICTON, and A. H. SELLERS, *Chairman*.

RESOLUTION

WHEREAS general agreement among the provinces has been reached as to the desirability of the early introduction of a special form for the registration of stillbirths;

AND WHEREAS agreement has also been reached as to the desirability of replacing the present system of double registration of stillbirths by a single form;

AND WHEREAS the studies of the Committee on Stillbirth Registration and Certification have indicated the effectiveness of its draft form in eliciting information on causes of stillbirth;

AND WHEREAS the hospital authorities and physicians co-operating have indicated their approval of the medical section of the form;

BE IT RESOLVED THAT this Section urge the early introduction on a national scale of a uniform stillbirth certificate similar to, if not identical with that proposed by the Subcommittee on Stillbirths;

BE IT RESOLVED FURTHER THAT the Dominion Bureau of Statistics be asked to make a special compilation of stillbirths by cause for the first 6 months the new form is in use.

ASSOCIATION NEWS

RESULTS OF THE 1938 EXAMINATIONS FOR THE CERTIFICATION OF SANITARY INSPECTORS

THE Central Board of Registration and Examination, Committee on the Certification of Sanitary Inspectors, has announced the results of the fourth annual examinations, which were held on September 20th, 21st and 22nd in six provincial centres: Vancouver, Edmonton, Regina, Winnipeg, Toronto and Montreal. Fifty candidates wrote the examinations. Of this number, 38 passed in all subjects, 7 were conditioned in one subject, and 4 failed. Candidates who are conditioned in one subject are permitted to rewrite the paper and to repeat the oral examination at the next annual examination. They must complete the work before the certificate is granted. The successful candidates, and the candidates conditioned in one subject, are as follows:

British Columbia: Gordon H. Keown, Vancouver; Clifford Mallett, Vancouver; Norman E. Pengelly, New Westminster; Walter W. Shorrock, Goldstream P.O. (*Communicable Diseases*); Edwin Southen, North Vancouver; Thomas N. Taylor, Vancouver.

Alberta: James H. Crichton, Calgary; Ernest V. Stanley, Calgary.

Saskatchewan: Ronald Gilbert, Regina.

Manitoba: Eric Hawksworth, Winnipeg.

Ontario: F. T. Badger, Toronto; V. S. Baker, London; G. Buckley, Toronto (*Sanitation*); T. P. Cox, Hamilton; L. I. Dodgson, Toronto; W. G. Doidge, London; R. G. Ford, Toronto; E. C. Gent, Toronto; L. H. Hancey, Toronto; S. Harris, Geraldton; C. R. Holmes, Walkerville; C. S. Huband, Ottawa; R. P. Hughes, Ottawa; J. M. Johnston, Toronto (*Communicable Diseases*); J. L. Kennedy, Hamilton; N. R. Laxton, Toronto; D. S. McKee, Toronto; R. M. MacPherson, Peterborough; J. Meehan, Timmins (*Sanitation*); R. L. Moore, Toronto; J. O'Hanley, Hamilton; O. W. Owen, Toronto; P. Payette, Cornwall (*Communicable Diseases*); G. H. Powell, Toronto; F. Rothery, Sudbury (*Communicable Diseases*); H. Sharp, Toronto; D. B. Shutt, Guelph; W. L. Smith, Toronto; W. C. Staples, Toronto; T. G. Waghorn, Brock-

ville; D. J. Wood, Peterborough. W. Gray, Toronto, was granted standing in the field investigation report and the oral examination.

Quebec: L. Auguste Beaubien, Nicolet; J. W. Gaudette, St. Hyacinthe; T. O. Lavoie, Montreal.

Nova Scotia: Allister Grant, Glace Bay (*Sanitation*).

The examination papers in the three subjects, *Sanitation*, *Food Control and Legislation*, and *Prevention and Control of Communicable Diseases*, were as follows:

SANITATION

Time: 3 hours

Important: Answer any FIVE questions

1. (a) Describe the construction of a satisfactory dug-well for use of a farm house, illustrating by a sketch.
(b) Outline the procedure which you would follow in taking a sample of water from a well.
(c) Describe the routine bacteriological tests of water, as conducted in a laboratory.
(d) Give in detail the method which you would follow in chlorinating a gallon of water from a polluted well.
2. A rural school accommodating 100 pupils is provided with flush toilets. Describe the design and construction of a suitable septic-tank installation for disposal of excreta, giving dimensions. Illustrate with a sketch. What is the function of each part of the installation?
3. (a) Define the following terms: house-drain, grease-trap, venting, back-siphonage, cross-connection.
(b) Describe in detail one method for testing a plumbing and drainage installation.
4. Outline the provisions which should be made in the construction of a camp for 100 men in a mining area, including bunk-house accommodation, provision of safe water, sanitary disposal of excreta, and disposal of refuse and manure.
5. (a) What is the composition of air?
(b) What factors influence heat-loss from the body?

(c) What points should be noted in investigating the atmospheric condition of a room?

(d) What are the requirements for ventilation of schools in the province or municipality in which you reside?

6. Write notes on: chemical toilet, the causes of lead poisoning, activated sludge treatment of sewage, air conditioning.

FOOD CONTROL AND LEGISLATION

Time: 3 hours

Important: Answer any FIVE questions

1. Discuss the pasteurization of milk under the following headings:

- (a) Definition (according to the regulations of your province).
- (b) Purpose.
- (c) Essential equipment in a dairy plant for pasteurizing and bottling.
- (d) Possible defects in equipment and operation.

2. You are asked to report on a small plant manufacturing "soft drinks". Outline in detail the steps which you would take in making the inspection, indicating the minimum requirements for such a plant.

3. (a) What departments of the Federal Government have responsibilities in connection with the distribution and sale of foods and drugs in Canada? Outline the responsibilities of these departments and how the work is conducted in each case.

(b) What responsibilities are assumed by a municipality in regard to the supervision of food offered for sale?

4. Name five diseases that are commonly transmitted through food (including milk), stating the causative agents, the modes of transmission, and methods of prevention.

5. (a) Outline the life history of the house-fly.

(b) What diseases may be transmitted by the house-fly? Indicate how the infection is transmitted in each disease.

(c) What measures should be taken in a municipality to control flies?

6. Write notes on: (a) Washing and sterilization of dairy-farm utensils; (b) interpretation of a bacteriological report of a milk sample; (c) washing and sterilization of dishes and eating utensils in a restaurant; (d) condemnation of canned foods.

PREVENTION AND CONTROL OF COMMUNICABLE DISEASES AND RELATED SUBJECTS

Time: 3 hours

Important: Answer any FIVE questions

1. What are the characteristics common to all communicable diseases? Discuss fully the modes of transmission of communicable diseases, giving examples.

2. Describe in detail the procedure in fumigating a dwelling house with hydrocyanic acid gas. What safeguards are required?

3. What is the cause of scarlet fever? How is this disease transmitted? What are the quarantine regulations relating to this disease in your province? What is the period of isolation? What measures may be taken to prevent scarlet fever?

4. Define "active immunity" and "passive immunity". Name three communicable diseases for which there are specific means of prevention by vaccination. Name the product which is used in each instance and state how it is administered.

5. What is the purpose of quarantining the contacts of certain communicable diseases? On what is the length of the quarantine period based? Why are quarantine measures more effective in some communicable diseases than in others? (Illustrate by reference to several diseases.) For what diseases are placards affixed to dwellings in your community? What is their purpose?

6. Write notes on: common causes of infant deaths, concurrent disinfection, disinfection of excreta of a typhoid patient, venereal diseases, transmission of tuberculosis.

The members of the Central Board desire to express their appreciation to the members of the six Provincial Examining Boards who co-operated in the conduct of the examinations. In each province the Chairman of the Board was named by the Department of Health and, with the assistance of two members, made the arrangements and conducted the examinations, which extended over a period of three days. The Boards of Examiners were as follows:

British Columbia: Dr. J. W. McIntosh, Chairman; Mr. Alexander McCulloch, C.S.I.(C.), and Mr. R. M. Martin, C.E.

Alberta: Dr. G. M. Little, Chairman; Mr. J. Butterfield and Dr. R. M. Shaw.

Saskatchewan: Mr. J. G. Schaeffer, B.Sc., Chairman; Mr. Frank Cartledge and Dr. George R. Walton.

Manitoba: Dr. C. R. Donovan, Chairman; Mr. W. P. Brereton and Mr. John Foggie.

Ontario: Dr. J. G. Cunningham, Chairman; Mr. Hugh McIntyre, A.R. San.I.; and in the absence of Dr. L. A. Pequegnat, Dr. R. D. Defries. In addition, the Committee is grateful to the following for their co-operation in the conduct of the oral examinations: Dr. D. T. Fraser, Dr. M. H. Brown, Mr. G. F. Fitzsimons, Dr. N. E. McKinnon, Dr. J. T. Phair, and Dr. A. R. B. Richmond.

Quebec: Mr. T. J. Lafrenière, C.E., Chairman; Dr. Ad. Groulx and Mr. Aimé Cousineau, C.E.

Since the holding of the first examinations in 1935, one hundred and thirty-four inspectors have obtained the Canadian certificate.

The Committee has given due notice to departments of health and sanitary inspectors that after December 31, 1938, every candidate desiring to take the examinations must have completed at least three years of high-school work

or its equivalent in secondary-school education. Realizing that many of those who have served in sanitary inspection for a number of years may desire to obtain the certificate but may not have the preliminary education required by the Committee, provision has been made, since the inception of the examinations in 1935, to permit those who have been employed as sanitary inspectors for at least one year to take the examinations without being obliged to meet the preliminary educational requirement. This exception has applied only to employed sanitary inspectors. Those registering on or before December 31, 1938, will be permitted to take the examinations in September, 1939, without furnishing evidence of having completed a satisfactory secondary-school education.

PLANS, PROGRAMS, AND PROGRESS

TUBERCULIN TESTING OF HIGH SCHOOL PUPILS IN THE FOOTHILLS HEALTH DISTRICT, ALBERTA

SIX hundred and thirty-one pupils in grades 9 to 12 were offered tuberculin testing and 561 pupils consented. Of this number 545 completed the tests, which consisted of an intradermal test followed by a second test if the first was negative. The material used was the purified protein derivative of tuberculin and the second dose was equivalent to one milligram of old tuberculin. The high percentage of positive reactions may be accounted for, firstly, because all known tuberculous families requested the tests and, secondly, the size of the final test-dose would detect practically all of those infected. Following the test, all who showed a positive reaction were given an X-ray examination and if the findings were suggestive, a physical examination was made.

The following figures show the results of the tests:

Number of pupils (grades 9 to 12)	631
Number of pupils tested	545
Pupils found positive on first test	51 (9.4%)
Pupils found positive on second test	155 (28.3%)
Pupils found positive on both tests	206 (37.7%)
Girls positive	123 (36%)
Boys positive	82 (40.7%)
Number of pupils given X-ray examination	202
Pupils given physical examination	34
<i>Findings following X-ray and physical examination:</i>	
Active cases	1
Cases for close observation....	4
Cases for routine observation	23
Not tuberculous	6

Two points perhaps warrant special attention although they are points usually observed. Although only 36 per cent. of 341 girls tested were positive, compared with 40.7 per cent. of 204 boys, and although only 18 girls required special examination compared with the 16 boys, yet the one active case was a girl and three of the four

suspicious cases requiring close observation were girls. It was noted also that our own high schools have tuberculin-positive rates of about 40 per cent. while the smaller schools in more rural districts had rates of about 25 per cent. Our largest high school, situated in the Turner Valley oil district, had, in spite of its industrial character, its poor housing and the perpetual odours of gas, a similar rate to that found in the purely rural group, namely 28.8 per cent.

We have found the two-dose procedure expensive because of the scattered nature of the group to be tested and the large amount of travelling involved. The time taken was equivalent to one full month for the full staff of the Health District, plus about one week of time for the technician and two doctors from the Central Alberta Sanatorium and an indeterminate amount of time at the Sanatorium in interpreting 202 X-rays. The cost was about as follows:

Health unit costs	\$ 900.00
X-ray films and tuberculin, and developer (financed by the Christmas seal fund of the High River Rotary Club)	300.00
Estimate of cost to sanatorium	500.00
	<hr/>
	\$1700.00

Including first and second tests, a total of 1,055 tests was given to these pupils. In addition, 56 teachers were given the same examination without finding any active disease. Two showed X-ray findings calling for further observation.—*Asbury Somerville, B.A., M.D., D.P.H., Medical Officer of Health, Foothills Health District, High River, Alberta.*

FRANCE MAKES DIPHTHERIA IMMUNIZATION COMPULSORY

THE Senate and the Chamber of Deputies of the Republic of France passed on June 25th a regulation making diphtheria immunization compulsory. The law reads:

"Antidiphtheria vaccination with l'anatoxine (toxoid) is compulsory during the second or third year of life. The parents or guardians are personally responsible for the carrying out of this measure, proof of which shall be furnished on admission to any school, nursery, vacation colony, or other assembly of children.

"During the first year of application of the present article, all children under 14 years of age attending the schools, if they have not yet been vaccinated against diphtheria, shall be subjected to such vaccination."

France is the first major nation to make diphtheria immunization compulsory. No child may be admitted to a school or nursery who has not been immunized. The regulations are to be administered by the Academy of Medicine and the Consultative Committee on Public Health.

POLIOMYELITIS IN CANADA

ONE hundred and fifty-four cases of poliomyelitis have been reported in Canada during the period August 28th to October 1st. Their distribution by provinces is as follows: British Columbia, 8; Alberta, 20; Saskatchewan, 10; Manitoba, 61; Ontario, 38; Quebec, 9; and New Brunswick, 8. During the first nine months of 1938 a total of 457 cases has been reported.

TYPHOID FEVER IN MERRITT, B.C.

AN outbreak of typhoid fever occurred in Merritt, B.C., during the middle of October. Investigation of the outbreak by Dr. Kenneth F. Brandon, D.P.H., on the instructions of Dr. H. E. Young, Provincial Health Officer, indicated that the disease was probably transmitted through raw milk. Twenty-six known cases and four suspected cases were reported. Two deaths have occurred.

